

A taxonomic revision of *Euphorbia* section *Anisophyllum* Roeper (Euphorbiaceae) in Australia

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Summary

Halford, D.A. & Harris, W.K. (2012). A taxonomic revision of *Euphorbia* section *Anisophyllum* Roeper (Euphorbiaceae) in Australia. *Austrobaileya* 8(4): 441–600. A systematic study of *Euphorbia* section *Anisophyllum* Roeper in Australia is presented. A total of 58 species are recognised of which 51 are native (48 endemic) and seven are naturalised. Twenty one species are described here as new: *E. accedens* Halford & W.K.Harris, *E. albrechtii* Halford & W.K.Harris, *E. crassimarginata* Halford & W.K.Harris, *E. fitzroyensis* Halford & W.K.Harris, *E. gregoriensis* Halford & W.K.Harris, *E. hassallii* Halford & W.K.Harris, *E. laciniloba* Halford & W.K.Harris, *E. litticola* Halford & W.K.Harris, *E. macdonaldii* Halford & W.K.Harris, *E. multifaria* Halford & W.K.Harris, *E. occulta* Halford & W.K.Harris, *E. papillata* Halford & W.K.Harris, *E. papillifolia* Halford & W.K.Harris, *E. philochalix* Halford & W.K.Harris, *E. porcata* Halford & W.K.Harris, *E. psilosperma* Halford & W.K.Harris, *E. thelephora* Halford & W.K.Harris, *E. trigonosperma* Halford & W.K.Harris, *E. verrucitesta* Halford & W.K.Harris, *E. vicina* Halford & W.K.Harris and *E. victoriensis* Halford & W.K.Harris. New species are illustrated while all species are described and their distributional range mapped, and notes on their distribution, habitat and phenology are given. Eleven new varieties are described as new: *E. australis* var. *glabra* Halford & W.K.Harris, *E. australis* var. *hispidula* Halford & W.K.Harris, *E. ferdinandi* var. *appendiculata* Halford & W.K.Harris, *E. ferdinandi* var. *saxosiplaniticola* Halford & W.K.Harris, *E. inappendiculata* var. *robustior* Halford & W.K.Harris, *E. mitchelliana* var. *longiloba* Halford & W.K.Harris, *E. papillata* var. *laevicaulis* Halford & W.K.Harris, *E. papillifolia* var. *polyandra* Halford & W.K.Harris, *E. thelephora* var. *australis* Halford & W.K.Harris, *E. thelephora* var. *rugosa* Halford & W.K.Harris, and *E. vaccaria* var. *erucoides* Halford & W.K.Harris. The new combinations *E. macdonaldii* var. *potentillina* (Baill.) Halford & W.K.Harris, based on *E. australis* var. *potentillina* Baill., *E. mitchelliana* var. *filipes* (Benth.) Halford & W.K.Harris, based on *E. filipes* Benth., and *E. schultzei* var. *comans* (W.Fitzg.) Halford & W.K.Harris based on *E. comans* W.Fitzg., are made. Lectotypes are chosen for *E. alsiniflora* Baill., *E. armstrongiana* Boiss., *E. australis* var. *semiglabra* Domin, *E. comans* W.Fitzg., *E. distans* W.Fitzg., *E. erythrantha* F.Muell., *E. inappendiculata* Domin, *E. filipes* Benth., *E. macgillivrayi* Boiss., *E. macgillivrayi* var. *yarrabensis* Domin, *E. macgillivrayi* var. *pseudoserrulata* Domin, *E. macgillivrayi* f. *glabrata* Domin, *E. mitchelliana* Boiss., *E. mitchelliana* var. *cairniana* Domin, *E. mitchelliana* var. *dietrichiae* Domin, *E. mitchelliana* var. *glauca* Benth., *E. mitchelliana* var. *stenophylla* Benth., *E. petala* Ewart & L.R.Kerr, *E. schizolepis* F.Muell. ex Boiss. and *E. schultzei* Benth. Keys to identify the species and varieties are provided.

Key Words: Euphorbiaceae, *Euphorbia* section *Anisophyllum* Roeper, *Chamaesyce*, Australia flora, taxonomy, nomenclature, identification keys, *E. accedens* Halford & W.K.Harris, *E. albrechtii* Halford & W.K.Harris, *E. australis* var. *glabra* Halford & W.K.Harris, *E. australis* var. *hispidula* Halford & W.K.Harris, *E. crassimarginata* Halford & W.K.Harris, *E. ferdinandi* var. *appendiculata* Halford & W.K.Harris, *E. ferdinandi* var. *saxosiplaniticola* Halford & W.K.Harris, *E. fitzroyensis* Halford & W.K.Harris, *E. gregoriensis* Halford & W.K.Harris, *E. hassallii* Halford & W.K.Harris, *E. inappendiculata* var. *robustior* Halford & W.K.Harris, *E. laciniloba* Halford & W.K.Harris, *E. litticola* Halford & W.K.Harris, *E. macdonaldii* Halford & W.K.Harris, *E. mitchelliana* var. *longiloba* Halford & W.K.Harris, *E. multifaria* Halford & W.K.Harris, *E. occulta* Halford & W.K.Harris, *E. papillata* Halford & W.K.Harris, *E. papillifolia* var. *laevicaulis* Halford & W.K.Harris, *E. papillifolia* Halford & W.K.Harris, *E. papillifolia* var. *polyandra* Halford & W.K.Harris, *E. philochalix* Halford & W.K.Harris, *E. porcata* Halford & W.K.Harris, *E. psilosperma* Halford & W.K.Harris, *E. thelephora* Halford & W.K.Harris, *E. thelephora* var. *australis* Halford & W.K.Harris, *E. thelephora* var. *rugosa* Halford & W.K.Harris, *E. trigonosperma* Halford & W.K.Harris, *E. vaccaria* var. *erucoides* Halford & W.K.Harris, *E. verrucitesta* Halford & W.K.Harris, *E. vicina* Halford & W.K.Harris, *E. victoriensis* Halford & W.K.Harris

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Introduction

In its broadest sense *Euphorbia* L. is one of the largest genera of angiosperms in the world comprising at least 2100 species and has an almost cosmopolitan distribution (Riina & Berry 2012). The morphological element that unifies this diverse genus is the cyathium which consists of a central pistillate flower surrounded by five clusters of staminate flowers within a cup-like involucre with a ring of lobes and glands on the rim. This unique reproductive structure resembles a bisexual flower and is generally interpreted as a complex pseudanthium. Recent studies present evidence that the cyathium could involve the expression of floral as well as inflorescence developmental pathways (Prenner & Rudall 2007; Prenner *et al.* 2011).

Euphorbia s.l. includes an astonishing array of vegetative forms from small leafy annuals to large cactus-like trees (Horn *et al.* 2012). Given the size and morphological diversity of the genus it is not surprising that the taxonomy of this genus is complex and often considered controversial. This is reflected in a long history of attempts to dismember the genus into numerous more homogeneous groups (e.g. *Chamaesyce* Gray, *Monadenium* Pax, *Pedilanthus* Neck. ex Poit., *Poinsettia* Graham and *Synadenium* Boiss.).

The genus *Chamaesyce* is one of the more easily recognizable segregates that is generally considered to be a ‘natural’ taxon and more or less well defined by a series of morphological, physiological and developmental characters (Dressler 1961; Webster *et al.* 1975; Hassall 1976; Evans & Kinghorn 1977; Koutnik 1987; Hayden 1988; Benedí & Orell 1992; Yang & Berry 2011). It is characterised by having a sympodial growth pattern, predominance of C₄ photosynthesis with the associated Kranz leaf anatomy, leaves opposite (predominantly distichous) and mostly asymmetrical at the base with interpetiolar stipules and seeds ecarunculate. The genus is widely distributed in subtropical and tropical regions throughout the world, with a particular centre of diversity in North America and is estimated to contain c. 350 species (Hassall 1977; Yang & Berry 2011). As in other regions of the world the

recognition of *Chamaesyce* in Australia has had limited acceptance (James & Harden 1990; Forster & Henderson 1995).

The current trends are tending to favour the adoption of a broad concept of the genus *Euphorbia* as recent phylogenetic analyses involving morphological characters (Park & Elisens 2000) and molecular sequence data (Steinmann & Porter 2002; Bruyns *et al.* 2006; Park & Jansen 2007; Zimmermann *et al.* 2010; Bruyns *et al.* 2011; Horn *et al.* 2012) indicate that the previously recognised segregated genera are nested well within *Euphorbia*. The six molecular phylogenies resolved *Euphorbia s.l.* into four major, well supported clades (A–D) which are formally recognised as subgenera (A = *E.* subg. *Rhizanthium* (Boiss.) Wheeler; B = *E.* subg. *Esula* Pers.; C = *E.* subg. *Euphorbia*; D = *E.* subg. *Chamaesyce* Raf.) (Bruyns *et al.* 2006, 2011; Horn *et al.* 2012). Yang *et al.* (2012) have recircumscribed *E.* subg. *Chamaesyce* and presented a formal classification, recognizing 15 sections. The previous segregated genus *Chamaesyce* is deeply imbedded within *E.* subg. *Chamaesyce* and formally recognised at the sectional level namely *E.* sect. *Anisophyllum* Roeser (Yang *et al.* 2012).

Euphorbia section *Anisophyllum* in Australia

In De Candolle’s *Prodromus*, Boissier (1862) enumerated 15 species of *Euphorbia* sect. *Anisophyllum* that are relevant to the Australian flora. In his account of *Euphorbia* in *Flora Australiensis*, Bentham (1873) recognised 17 species within *E.* sect. *Anisophyllum*, one species *E. hirta* L. (as *E. pilulifera* L.) appears to be an early naturalisation. Since Bentham’s work numerous species (18) and infraspecific (13) taxa based on Australian material have been described by various botanists (e.g. Fitzgerald 1918; Domin 1927; Thomson 1992). The taxonomy of the Australian species of *E.* sect. *Anisophyllum* has not been reviewed on a national level since 1977. Hassall (1977) as part of his doctoral studies on the tribe *Euphorbieae* in Australia, recognised 22 native species as well as 14 infraspecific taxa. He supported the recognition of *Chamaesyce* (*E.* sect. *Anisophyllum*) as distinct from *Euphorbia* and transferred 15 names to

Chamaesyce (Hassall 1976). He proposed a number of new taxa (species, subspecies and varieties) and lectotypifications but these were never validly published and the majority of his taxonomy on this group has remained unpublished.

The first author found that while preparing an account of *Euphorbia* for the *Flora of Australia* that it was apparent there were considerable taxonomic problems in this section of the genus. Many more collections and information relevant to the taxa concerned have become available since Hassall's work. A number of the species were previously poorly known and there was confusion over the application of some names. We have found, as Bentham and Hassall have before us, that the specific and infraspecific boundaries in the Australian *E. sect. Anisophyllum* are not easily defined. Although some morphological features such as seeds are reasonably diagnostic for individual species, variation across most characters is extensive. However, it is felt that separation of these entities at the specific rank is more desirable than having a few 'mega-species' with numerous infraspecific units. While the present study resolves many taxonomic issues in the Australian species of *E. sect. Anisophyllum*, still other problems remain to be examined in more detail.

We have recognised 58 species of which 51 are native (48 endemic) and seven are naturalised. Three native species (*Euphorbia bifida* Hook. & Arn., *E. obliqua* Endl. and *E. pallens* Dillwyn) extend to South East Asia and the south west Pacific. The species of *Euphorbia* sect. *Anisophyllum* are widespread in Australia and are present in all States although only a handful of species occur in Victoria (Vic) and Tasmania has none. Most species occur in the northern and central part of the continent where there are six main centres of species' richness: Hamersley – Pilbara (Western Australia [WA]), Kimberley – Victoria River (WA & Northern Territory [NT]), north western Highlands (Queensland [Qld]), Einasleigh – Desert Uplands (Qld), MacDonnell Ranges – Finke (NT & South Australia [SA]) and northern Flinders Range (SA).

Cytology

The cytology findings reported by Hassall (1976, 1977) have been re-interpreted in light of the present study. The voucher collections (lodged at BRI) from that study have been re-determined in line with the taxa recognised here (**Appendix 1**). Hassall recorded two base chromosome numbers for the Australian taxa, $n = 8$ & 11 as well as an apparent tetraploid ($n = 22$) race of *E. dallachyana* Baill.

Groupings of species within *E. sect. Anisophyllum* in Australia

Boissier (1862) arranged the then known species in *E. sect. Anisophyllum* into eight subsections. The Australian taxa that he dealt with were placed into four subsections: *E. subsect. Chamaesyce* Boiss. (*E. armstrongiana* Boiss., *E. australis* Boiss., *E. drummondii* Boiss., *E. erythrantha* F.Muell. [= *Euphorbia australis* var. *erythrantha* (F.Muell.) Benth., in this revision], *E. minutifolia* Boiss. [= *E. dallachyana*, in this revision]); *E. subsect. Elegantes* Boiss. (*E. schizolepis*); *E. subsect. Hypericifoliae* Boiss. (*E. baueri*, unplaced in this revision, *E. bifida*, *E. macgillivrayi* (= *E. bifida*, in this revision), *E. micradenia* (= *E. bifida*, in this revision), *E. mitchelliana* Boiss., *E. muellerii* Boiss.); *E. subsect. Sclerophyllae* Boiss. (*E. atoto* (= *E. pallens*, in this revision), *E. myrtoides* Boiss., *E. obliqua*). Bentham (1873) did not recognise any subdivisions within *E. sect. Anisophyllum* and made no comment regarding Boissier's groupings.

Yang & Berry (2011) found Boissier's classification to be of little value in designating monophyletic groups within *Euphorbia* sect. *Anisophyllum*. Their data supported three main lineages within the group namely the "Acuta", "Peplis" and "Hypericifolia" clades. All the Australian species sampled (*E. australis*, *E. coghlanii* F.M.Bailey, *E. dallachyana*, *E. carissoides* F.M.Bailey, *E. schultzei* Benth., *E. schizolepis* F.Muell. ex Boiss., *E. sp. nov.* 'Australia' = *E. occulta* Halford & W.K.Harris) were found to group within the large cosmopolitan distributed *Hypericifolia* clade (= *E. subsect. Hypericifoliae* Boiss., Yang *et al.* (2012).

Hassall (1977) evaluated the relationships within the Australian species of *Chamaesyce* (= *E.* sect. *Anisophyllum*) using numerical techniques involving morphological and cytological data. He noted a good correlation in the data and organised the Australian species into three groups that essentially corresponded to karyotype variation which paralleled, to some degree, patterns in morphology in the Australian species. Our observations generally support Hassall's delimitation of the Australian species into three groups. These groups are:

Group 1 (*E.* sect. *Chamaesyce* [Hassall 1977]): This, represented by 35 species, is the largest and most widespread of the three groups. The species are found mostly in inland habitats. The plants are generally of small stature (mostly <40 cm) and often with prostrate or decumbent stems; leaves are small (2–25 × 1–9 mm); cyathia solitary at the nodes although often clustered on shortened leafy lateral branchlets; seeds small (0.7–2.2 mm long), generally tetraquetrous in cross-section, with surfaces variously finely sculptured or smooth, mostly mucilaginous when moistened. Fourteen of the species have been recorded having chromosome number $n = 11$ and one species with a tetraploid race $n = 22$ (**Appendix 1**).

Within this group there are a number of subgroupings that we perceive to be morphologically similar species. These are:

subgroup australis: *E. accedens* Halford & W.K.Harris, *E. australis*, *E. careyi* F.Muell., *E. centralis* B.G.Thomson, *E. macdonaldii* Halford & W.K.Harris, *E. occulta*, *E. schultzii*, *E. thelephora* Halford & W.K.Harris, *E. vaccaria* Baill.

subgroup drummondii: *E. drummondii*, *E. dallachyana*, *E. fitzroyensis* Halford & W.K.Harris, *E. findersica* Halford & W.K.Harris, *E. gregoriensis* Halford & W.K.Harris, *E. hassallii* Halford & W.K.Harris, *E. philochalix* Halford & W.K.Harris, *E. porcata* Halford & W.K.Harris, *E. verrucitesta* Halford & W.K.Harris.

subgroup ferdinandi: *E. crassimarginata* Halford & W.K.Harris, *E. ferdinandi*

F.Muell., *E. papillata* Halford & W.K.Harris, *E. multifaria* Halford & W.K.Harris.

subgroup ophiolitica: *E. laciniloba* Halford & W.K.Harris, *E. maconochieana* B.G.Thomson, *E. ophiolitica* (P.I.Forst.) Y.Yang, *E. papillifolia* Halford & W.K.Harris.

subgroup petala: *E. albrechtii* Halford & W.K.Harris, *E. cinerea* W.Fitzg., *E. petala* Ewart & L.R.Kerr.

subgroup wheeleri: *E. myrtoides*, *E. sharkoensis* Baill., *E. victoriensis* Halford & W.K.Harris, *E. wheeleri* Baill.

Unplaced species: *E. inappendiculata* Domin, *E. armstrongiana*.

Group 2 (*E.* sect. *Sclerophyllae* [Hassall 1977]): This group is represented by 13 species. The species are in coastal and inland habitats in mostly northern Australia. The plants are generally of larger stature (up to 80 cm) and often with decumbent or erect stems; leaves are generally larger (5–80 × 1–22 mm); cyathia solitary at the nodes or in lax to congested, leafy to bracteose dichasia; seeds generally larger (1–2.2 mm long), tetragonous, trigonous, biconvex or suborbicular in cross-section, with surfaces variously finely sculptured or smooth, non-mucilaginous or mucilaginous when moistened. Five of the species have been recorded having chromosome number $n = 8$ (**Appendix 1**).

The following groupings are perceived to be morphologically similar species.

subgroup coghlanii: *E. biconvexa* Domin, *E. clementii* Domin, *E. coghlanii*, *E. psilosperma* Halford & W.K.Harris, *E. trigonosperma* Halford & W.K.Harris.

subgroup pallens: *E. litticola* Halford & W.K.Harris, *E. muelleri*, *E. obliqua*, *E. pallens*, *E. psammogeton* P.S.Green.

subgroup bifida: *E. bifida*, *E. mitchelliana*, *E. vicina* Halford & W.K.Harris.

Group 3 (*E.* sect. 'Elegantes' [Hassall 1977]): This group is represented by 3 species. The species occur in inland habitats of northern Australia. The plants are generally of larger stature (up to 120 cm) and mostly decumbent to erect stems; leaves are ± large (5–36 × 3–19 mm);

cyathia solitary at the nodes; seeds large (1.9–3.2 mm long), tetragonous or tetraquetrous in cross-section, with surfaces variously coarsely sculptured or smooth, and mucilaginous when moistened. The chromosome number for these species is unknown.

Included species: *E. carissoides*, *E. kimberleyensis* B.G.Thomson, *E. schizolepis*.

The groups and subgroups have not been given formal names for it is more appropriate that this be done within the context of a broader investigation. In the following ‘Taxonomy’ section we have arranged the species alphabetically.

Materials and methods

This study has been primarily herbarium based, together with field work undertaken by the authors. Herbarium collections on loan to BRI from herbaria AD, DNA, HO, MEL, NSW, NT and PERTH were studied and annotated, and selected material from G, K, P and W was also seen. The Herbarium acronyms follow Holmgren *et al.* (1990). All specimens cited in this revision have been examined by one or both of the authors, unless indicated otherwise by ‘*n.v.*’. Those specimens seen only as a digital image either online (<http://www.jstor.org>) or images sent from other herbaria in lieu of sending the specimen are indicated by ‘image seen’ while those seen only as a microfiche image are indicated by the citation of the relevant IDC microfiche. Unless otherwise stated the species in this treatment are endemic to Australia. Species considered naturalised in Australia are indicated by an asterisk ‘*’ preceding the species name in the ‘key to species’ and in the main species entry in the ‘Taxonomy’ section. The descriptions of the species’ naturalised in Australia are based on the variation observed in specimens collected from Australia and therefore may not reflect the full variation observed in the species over its native range.

The revision is based on an assessment of morphological characters of about 5300 dried herbarium collections. We used the alpha taxonomic techniques of studying characters of the specimens and repeatedly sorting the specimens into groups until the most efficient

characters for sorting had been determined. Measurements in tenths of a millimetre were made with a dissecting microscope at 10 to 40 times magnification and eyepiece graticule. Descriptions of colour of vegetative and floral parts are either from the information on herbarium labels or information recorded by the authors during field studies. The ventral surface of the seed is the side facing towards the centre of the capsule before dehiscence; the dorsal surface is the side facing away from the centre of the capsule. Seed shape is the outline of the seed when the dorsal surface is viewed radially. All measurements were made either on fresh material, dried material, material preserved in 70% ethanol or dried material reconstituted by placing in boiling water for a few minutes. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Information on plant size, flowering and fruiting times, and habitat of occurrence was obtained from herbarium labels. Locality data on herbarium specimens were used to generate the distribution maps using DIVA-GIS version 7.5.0.0.

Seed photographs were taken with a Nikon DS-Fil microscope camera attached to a stereomicroscope (Leica MZ6). Single images were combined with Helicon Focus version 5.2 (Helicon Soft, <http://HeliconFocus.com>) to produce composite images to increase the depth of field. A small number of mature seeds of each taxa were tested for the production of a mucilaginous layer by using the method of Jordan & Hayden (1992). Seeds were hydrated in water for 5 min, then examined under a dissecting microscope for the presence of mucilage.

Although the taxa studied flower and fruit early in their development there are many herbarium collections that we have been unable to identify to species because the collections were of insufficient quality or lacking sufficient floral or fruiting parts (e.g. seeds).

Common abbreviations used in the specimen citations include N.P. (National Park), N.R. (Nature Reserve) and S.F. (State Forest).

Taxonomy

Euphorbia sect. **Anisophyllum** Roeper in J.E.Duby, *Bot. Gall.* 2nd edn, 1: 412 (1828).
Type: *Euphorbia peplis* L. (lecto: *fide* Wheeler [1941: 111]).

Chamaesyce Gray, *Nat. Arr. Brit. Pl.* 2: 260 (1821). **Type:** *Chamaesyce maritima* Gray, *nom. illeg.*, = *C. peplis* (L.) Prokh. (lecto: *fide* Millspaugh [1909: 300] *n.v.*, from Yang *et al.* [2012]).

Monoecious (rarely dioecious) annuals or herbaceous perennials, few to many stems arising from crown of taproot, milky latex in all parts, growth sympodial, the primary axis exhibits no further development above the epicotyl, growth continues through development of lateral or secondary axes. Stipules present, persistent, connate forming

interpetiolar sheath, entire or deeply bipartite. Leaves opposite, distichous, petiolate, usually with Kranz anatomy, the blades entire to variously toothed, base is usually markedly asymmetrical. Cyathia terminal but appearing axillary, solitary at the nodes, or in lax to congested, leafy to bracteose dichasia. Involucre with 4 (rarely 5 or 6) glands; glands with or without petaloid appendages. Staminate flowers few to many, pedicellate, naked and monandrous. Pistillate flowers pedicellate, naked, hypogynous disc entire or fimbriate; ovary 3-locular with one pendant ovule in each locule; styles 3, free or basally connate, bifid or entire. Fruit capsular, 3-seeded, separating septicidally into three 2-valved cocci leaving a persistent columella. Seeds ecarunculate, smooth or variously sculptured, mucilaginous or non-mucilaginous when moistened.

Key to species of *Euphorbia* section *Anisophyllum* in Australia (distribution in states indicated by acronyms)

1	Capsules with hairs	2
1.	Capsules glabrous	28
2	Indumentum on stems consisting of two hairs types; white short ± appressed crispate hairs to 0.5 mm long and yellow spreading segmented hairs to 1.5 mm long; cyathia in dense capitate, terminal or axillary cymose clusters	3
2.	Indumentum on stems consisting of one hair type or absent; cyathia solitary, clustered on congested lateral branchlets, or in lax to congested leafy terminal and axillary dichasial cymes	4
3	Stems prostrate or rarely decumbent; cyathia in terminal cymose clusters (NSW, Qld)	37. * <i>E. ophthalmica</i>
3.	Stems ascending to erect; cyathia in terminal and axillary cymose clusters (NSW, NT, Qld, WA)	21. * <i>E. hirta</i>
4	Capsules with hairs unevenly distributed over surface either restricted to keels or towards the base of the capsule	5
4.	Capsules with hairs evenly distributed over surface	10
5	Seeds >1.9 mm long (WA)	24. <i>E. kimberleyensis</i>
5.	Seeds <1.9 mm long.	6
6	Capsules with hairs mostly towards the base; hairs ≥0.8 mm long (NT, WA)	54. <i>E. vaccaria</i>
6.	Capsules with hairs restricted to keels; hairs mostly <0.8 mm long	7

- 7 Capsules ≤ 1.5 mm across; involucral gland appendages < 0.2 mm long; staminate flowers per cyathium < 10 ; stems prostrate or weakly ascending, glabrous on lower surface (NSW, NT, Qld, WA). **44. *E. prostrata**
7. Capsules > 1.5 mm across or if less then involucral gland appendages > 0.2 mm long, staminate flowers per cyathium > 10 and stems erect or if prostrate or ascending then evenly hairy **8**
- 8 Capsules distinctly wider than long, 2–3 mm across, deeply 3-lobulate (NT, Qld, WA) **48. E. schultzei**
8. Capsules \pm as long as wide, 1.5–2.3 mm across, shallowly 3-lobulate. **9**
- 9 Leaf blades 7–70 mm long, glabrous or with a few scattered hairs, with margins entire or finely serrulate; seeds tetragonous or trigonous in transverse section; seed surfaces with 3–7 prominent narrow rounded transverse ridges (NT, Qld, WA) **30. E. mitchelliana**
9. Leaf blades 3–7 mm long, sparsely to densely hairy, with margins often coarsely serrate; seeds tetraquetrous in transverse section; seed surfaces with low faint to distinct irregular ridges (NT, Qld, SA, WA) **9. E. centralis**
- 10 Seeds ≥ 1.9 mm long **11**
10. Seeds < 1.9 mm long. **12**
- 11 Stems decumbent to erect, moderately to densely hairy with hairs to 2 mm; involucral gland appendages dentate to deeply lacinate, hairy abaxially or if glabrous then styles entire (NT, WA). **47. E. schizolepis**
11. Stems usually prostrate, sparsely to densely hairy with hairs to 0.3 mm long; involucral gland appendages entire or shallowly lobed, glabrous; styles bifid (NT) **31. E. muelleri**
- 12 Gland appendages erect concealing involucral glands; involucral lobes obovate, 0.8–1 mm long (Qld) **35. E. occulta**
12. Gland appendages spreading radially not concealing involucral gland or absent; involucral lobes triangular to broad-triangular or subulate, 0.2–0.8 mm long **13**
- 13 Styles entire or scarcely notched **14**
13. Styles bifid for at least 1/3 of their length **18**
- 14 Seeds < 1 mm long (NT, Qld) **27. E. macdonaldii**
14. Seeds ≥ 1 mm long **15**
- 15 Involucral glands patelliform, either \pm planar or shallowly concave; gland appendages deeply lacinate with narrow attenuate teeth, ≥ 0.4 mm long (NT, Qld, SA, WA) **9. E. centralis**
15. Involucral glands cupuliform, deeply sunken in centre with distinct thickened rim; gland appendages entire or shallowly irregularly lobed or bluntly toothed, up to 0.6 mm long **16**
- 16 Capsules distinctly longer than wide (NSW, NT, Qld, SA) **51. E. thelephora**
16. Capsules \pm as long as wide or distinctly wider than long **17**
- 17 Capsules distinctly wider than long; leaf margins serrate; dorsal faces of seeds with 3–5 prominent \pm transverse or irregular, broad ridges (NT, Qld, WA) **48. E. schultzei**
17. Capsules \pm as long as wide; leaf margins entire or minutely toothed distally; dorsal faces of seeds with 5–7 prominent \pm transverse, narrow ridges (NT, Qld). **1. E. accedens**

- 18 Pedicel of mature capsules <1 mm long; capsules not completely exserted from involucre at maturity causing the involucre to split (NT, Qld, WA) **52. *E. thymifolia**
18. Pedicel of mature capsules ≥1 mm long; capsules completely exserted from involucre at maturity **19**
- 19 Cyathia in lax terminal dichasia or monochasia or in congested axillary bracteose dichasia **20**
19. Cyathia solitary at nodes or in congested short lateral leafy branches (leaves on lateral branches usually smaller in size than main branches but not reduced to bracts) **22**
- 20 Capsules minutely papillose; gland appendages absent or if present then ≤0.1 mm long (WA) **56. E. vicina**
20. Capsules smooth; gland appendages present, >0.1 mm long. **21**
- 21 Cyathia in axillary or terminal congested dichasial cymes (NSW, NT, Qld, WA) **6. E. bifida**
21. Cyathia in terminal lax dichasial or monochasial cymes (NT, Qld WA) **30. E. mitchelliana**
- 22 Hairs on capsules appressed; seeds ≤1 mm long; annual herbs to 10 cm high with prostrate or weakly ascending stems; leaf blades green often with elongate purple spot centrally; stipules 1–2.3 mm long; hairs on stem up to 0.8 mm long (all mainland States) **29. *E. maculata**
22. Hairs on capsules spreading or if appressed then either seeds >1 mm long or herbaceous perennials with ascending to erect stems or leaf blades yellowish green or stipules <1 mm long or hairs on stems to 0.2 mm long **23**
- 23 Capsules depressed ovate or transversely elliptic in lateral view, distinctly wider than long, acutely keeled; leaf blades ovate, oblong or obovate, >1.5 times longer than wide (NT, Qld, WA) **48. E. schultzei**
23. Capsules broad-ovate to very broad-ovate or broad-elliptic in lateral view, as long as wide or if depressed ovate then only slightly wider than long, obtusely keeled and leaf blades elliptic to broad elliptic and ≤1.5 times longer than wide **24**
- 24 Gland appendages deeply lacinate with narrow attenuate teeth (NT, Qld, SA, WA) **9. E. centralis**
24. Gland appendages entire, bluntly lobed or acutely toothed **25**
- 25 Gland appendages white rarely pale pink, entire; stems prostrate; capsules conspicuously papillose and only sparsely hairy with hairs up to 0.1 mm long; leaf blades strongly asymmetric at base (NT, WA) **28. E. maconochieana**
25. Gland appendages red, yellow or if white or pink then irregularly lobed or toothed; stems prostrate, ascending to erect; capsules smooth or if papillose then only minutely so and sparsely to densely hairy with hairs 0.1–0.5 mm long; leaf blades weakly to strongly asymmetric at base **26**
- 26 Stems longitudinal ribbed (Qld) **36. E. ophiolitica**
26. Stems not longitudinal ribbed **27**

- 27 Cyathia mostly unisexual; hairs on stems ≤ 0.2 mm long; involucre glands \pm flat, 0.3–0.5 mm long by 0.4–0.8 mm wide (WA) **7. *E. careyi***
27. Cyathia bisexual; hairs on stems > 0.2 mm long or if equal to or shorter then involucre glands concave or with shallow central pit, < 0.3 mm long and < 0.4 mm wide (all mainland States except Vic) . . . **4. *E. australis***
- 28 Dorsal faces of seeds smooth, without ornamentation or surface irregularities; seeds tetragonous, trigonal, biconvex or suborbicular in transverse section **29**
28. Dorsal faces of seeds sculptured or variously ornamented sometimes only obscurely so or if smooth then seed tetraquetrous in transverse section. **37**
- 29 Involucre glands, sessile, pressed flat against the outer surface of the involucre; gland appendages absent; involucre lobes oblong to obovate, deeply lacinate distally, ≥ 1 mm long (WA) **11. *E. clementii***
29. Involucre glands stipitate, spreading; gland appendages usually present sometimes inconspicuous; involucre lobes triangular to subulate, mostly < 1 mm long **30**
- 30 Capsules ≥ 3.5 mm long; seeds ≥ 1.9 mm long; styles ≥ 1.5 mm long; herbaceous woody perennials to 120 cm high (Qld) **8. *E. carissoides***
30. Capsules < 3.5 mm long; seeds < 1.9 mm long; styles mostly < 1.5 mm long; herbaceous perennials mostly less than 80 cm high **31**
- 31 Seeds biconvex in transverse section (NT, Qld, SA, WA) **5. *E. biconvexa***
31. Seeds trigonous or suborbicular or tetragonous in transverse section **32**
- 32 Capsules ≥ 3 mm long; stipules ≥ 2 mm long (NT, Qld, WA) **26. *E. litticola***
32. Capsules < 3 mm long; stipules < 2 mm long **33**
- 33 Leaf blades < 5 mm wide; styles entire or scarcely divided distally (NT, WA) **46. *E. psilosperma***
33. Leaf blades > 5 mm wide or if less then styles bifid for one third or more of their length **34**
- 34 Stipules triangular to broad-triangular, pubescent on adaxial surface; seeds not becoming mucilaginous when moistened; growing on sandy coastal foreshores **35**
34. Stipules subulate to narrow-triangular, glabrous on adaxial surface; seeds mucilaginous when moistened; growing in inland areas on various soils and coastal sands **36**
- 35 Leaf blades ≤ 20 mm long and ≤ 10 mm wide; cyathia solitary in upper axils (Qld) **34. *E. obliqua***
35. Leaf blades > 20 mm long and > 10 mm wide; cyathia in congested dichasial cymes (Qld) **38. *E. pallens***
- 36 Seeds suborbicular in transverse section; plants most commonly growing on clay soils (NT, Qld, WA) **12. *E. coghlanii***
36. Seeds trigonous in transverse section; plants most commonly growing on sandy soils (NT, Qld, WA). **53. *E. trigonosperma***
- 37 Dorsal and ventral surfaces of seeds with 4–6 transverse grooves or foveate to reticulate-foveate **38**
37. Dorsal and ventral surfaces of seeds smooth, or faintly or distinctly transversely or irregularly ridged **39**

- 38 Dorsal and ventral surfaces of seeds with 4–6 transverse grooves (**Fig. 25B**) (NT, WA) **3. E. armstrongiana**
38. Dorsal and ventral surfaces of seeds foveate to reticulate-foveate (**Figs 28L & M**) (all mainland States except Vic) **58. E. wheeleri**
- 39 Seeds ≥ 1.9 mm long, ≥ 1.5 mm wide **40**
39. Seeds < 1.9 mm long or if ≥ 1.9 mm then < 1.5 mm wide **41**
- 40 Capsules papillose; surface of seeds with low rounded irregular ridges with exotesta distinctly thicker on the ridges; gland appendages dentate to lacinate, (0.5) 1.3–2.5 mm long (WA) **24. E. kimberleyensis**
40. Capsules smooth; surface of seeds with faint narrow irregular ridges with exotesta of even thickness over surface; gland appendages entire or shallowly lobed, 0.6–1.5 mm long (NT) **31. E. muelleri**
- 41 Cyathia in lax to congested leafy terminal dichasia or monochasia or in congested axillary bracteose dichasia **42**
41. Cyathia solitary at the nodes, sometimes clustered on short leafy lateral branches **46**
- 42 Seeds orbicular or very broad-ovate in outline, ≥ 1.5 mm long, > 1.2 mm wide, \pm suborbicular or slightly trigonal in transverse section, surfaces faintly irregularly ridged; capsules > 2.5 mm long and > 3 mm wide (NSW, Qld) **45. E. psammogeton**
42. Seeds ovate to elliptic or broad-ovate in outline, < 1.5 mm long or if 1.5 mm long then < 1.2 mm wide, tetragonous in transverse section or if trigonal in transverse section then surface distinctly ridged; capsules < 2.5 mm long and < 3 mm wide **43**
- 43 Capsules minutely papillose; gland appendages absent or if present ≤ 0.1 mm long (WA) **56. E. vicina**
43. Capsules smooth; gland appendages present, > 0.1 mm long **44**
- 44 Stipules broad-triangular, 0.3–0.6 mm long, with margins lacerate, teeth gland-tipped (NSW, NT, Qld, WA) **22. *E. hyssopifolia**
44. Stipules deeply bipartite, lobes subulate to narrow-triangular, 0.6–2 mm long, with margins entire or lacinate, sometimes with teeth gland-tipped **45**
- 45 Cyathia in terminal lax dichasial or monochasial cymes, usually above subtending leaves (NT, Qld, WA) **30. E. mitchelliana**
45. Cyathia in congested dichasial cymes, mostly axillary on short lateral branchlets, usually shorter than subtending leaf (NSW, NT, Qld, WA) **6. E. bifida**
- 46 Stems hairy, sometimes only proximally **47**
46. Stems glabrous **55**
- 47 Styles hairy, bifid; capsules smooth, slightly wider than long (Qld) . . . **40. E. papillifolia**
47. Styles glabrous or if with a few scattered hairs then style entire, and capsules papillose and distinctly longer than wide **48**
- 48 Styles entire, 0.3–1.1 mm long; capsules widest at the middle (NSW, NT, Qld, SA) **51. E. thelephora**
48. Styles bifid or if entire then 0.2–0.3 mm long and capsules usually wider below the middle **49**

49. Involucral glands cupuliform, deeply sunken in centre with distinct rim 50
49. Involucral glands patelliform, either \pm planar or concave with tangential trough but not deeply sunken in centre with distinct rim 52
50. Capsules distinctly wider than long, $1.5\text{--}1.8 \times 2\text{--}2.7$ mm, deeply 3-lobulate (NT, Qld, WA) 48. *E. schultzei*
50. Capsules only slightly wider than long, $1.4\text{--}2.1 \times 1.5\text{--}2$ mm, shallowly 3-lobulate 51
51. Exotesta \pm of even thickness; gland appendages <0.1 mm long or if longer then usually deeply lobed; leaves usually ≥ 3 times as long as wide (NT, Qld, WA) 20. *E. hassallii*
51. Exotesta of uneven thickness, always thicker on ridges; gland appendages >0.1 mm long, entire; leaves <3 times as long as wide (NT) 19. *E. gregoriensis*
52. Gland appendages conspicuous, ≥ 0.3 mm long; staminate flowers per cyathia mostly 10 or more; stems sparsely to densely hairy with appressed to spreading hairs ≤ 0.5 mm long 53
52. Gland appendages inconspicuous and <0.3 mm long or absent; staminate flowers per cyathia <10 ; stems sparsely hairy with spreading hairs ≥ 0.5 mm long 54
53. Gland appendages reniform, entire; capsules papillose (visible at $10\times$ mag.); styles $0.7\text{--}1$ mm long (NT, WA) 28. *E. maconochieana*
53. Gland appendages obdeltoid to oblong with toothed margin; capsules smooth; styles $0.4\text{--}0.6$ mm long (Qld) 25. *E. laciniloba*
54. Styles bifid; involucral glands $0.05\text{--}0.15 \times 0.1\text{--}0.2$ mm; gland appendages <0.1 mm long (NSW, NT, Qld, SA, WA) 23. *E. inappendiculata*
54. Styles entire; involucral glands $0.2\text{--}0.3 \times 0.4\text{--}0.5$ mm; gland appendages ≥ 0.1 mm long (NT, Qld) 7. *E. macdonaldii*
55. Seeds faces \pm smooth 56
55. Seeds faces sculptured or variously ornamented sometimes only obscurely so 65
56. Capsules widest below the middle; seeds <1 mm long 57
56. Capsules widest at the middle or if widest below middle then seeds >1 mm long. 58
57. Involucral glands cupuliform; leaf blades oblong or obovate, >1.5 times as long as wide, margins minutely toothed distally (NT, WA) 10. *E. cinerea*
57. Involucral glands patelliform; leaf blades oblong, elliptic to broad elliptic, ≤ 1.5 times as long as wide, margins serrulate (NT, Qld) 27. *E. macdonaldii*
58. Involucral glands cupuliform, surface deeply sunken, often with thickened rim 59
58. Involucral glands patelliform, surface flat or concave 63
59. Capsules distinctly longer than wide 60
59. Capsules more or less as long as wide 61
60. Gland appendages ≥ 0.1 mm long; seeds ≥ 0.7 mm wide (radially) (NSW, NT, Qld, SA) 40. *E. papillata*
60. Gland appendages absent or if present then <0.1 mm long or if 0.1 mm long then seeds <0.7 mm wide (radially) (NSW, NT, Qld, SA, WA) 16. *E. ferdinandi*

- 61 Stems and capsules conspicuously papillose (visible at 10× mag.) (NSW, NT, Qld, SA) **40. E. papillata**
61. Stems smooth; capsules smooth or inconspicuously papillose (visible at 40× mag.) **62**
- 62 Leaf blades ≤2 times as long as wide, oblong, oblong-obovate to obovate, 2.8–7 × 1.6–3.8 mm; stems prostrate, rarely ascending to erect; stipules 0.4–1 mm long (NSW, Qld, SA, Vic, WA) **32. E. multifaria**
62. Leaf blades >2 times longer than wide, narrow oblong, 6–11 × 2–3.6 mm; stems ascending to erect, rarely prostrate; stipules 0.8–1.5 mm long (NT, Qld) **39. E. papillata**
- 63 Styles entire (NSW, NT, Qld, SA) **51. E. thelephora**
63. Styles bifid 1/3–1/2 of their length **64**
- 64 Plants monoecious; gland appendages deeply dentate or divided to base, 0.3–0.4 mm long; capsules minutely papillose (visible at 40× mag.); growing in sandy clay soils among rocky outcrops and on gravelly hill slopes (SA) **18. E. flindersica**
64. Plants dioecious rarely monoecious; gland appendages entire, erose or shallowly irregularly lobed, mostly 0.4–0.9 mm long rarely shorter; capsules smooth or rarely minutely papillose; growing in red clay loams to heavy black clays, rarely sandy soils on plains or undulating to hilly terrain (NSW, Qld) **40. E. papillifolia**
- 65 Capsules ≥1.2 times wide as long, transversely broad-elliptic in lateral view, deeply 3-lobulate; involucre glands cupuliform; gland appendages entire (NT, Qld, WA) **48. E. schultzei**
65. Capsules <1.2 times wide as long, or if ≥1.2 times as long as wide then either capsules broad-ovate to depressed ovate in lateral view and shallowly 3-lobulate or involucre glands patelliform or gland appendages toothed or deeply irregularly lobed **66**
- 66 Seeds <1 mm long. **67**
66. Seeds ≥1 mm long **71**
- 67 Styles entire **68**
67. Styles bifid for 1/3–1/2 of their length **69**
- 68 Involucre glands cupuliform; leaf blades >1.5 times as long as wide, margins minutely toothed distally (NT, WA). **10. E. cinerea**
68. Involucre glands patelliform; leaf blades ≤1.5 times as long as wide, margins serrulate (NT, Qld) **27. E. macdonaldii**
- 69 Stems rooting at nodes; stipules 0.5–0.6 mm long, broadly triangular, not bilobed (NSW, Qld, SA) **49. *E. serpens**
69. Stems not rooting at nodes; stipules 0.9–1.2 mm long, bilobed, lobes triangular **70**
- 70 Dorsal faces of seed concave, with prominent irregular rounded ridges; gland appendages entire, crenulate or shallowly irregularly lobed (NT, WA). **42. E. philochalix**
70. Dorsal faces of seed planar, with faint rounded, irregular ridges; gland appendages toothed or deeply lobed (WA) **50. E. sharkoensis**

71. Involucral glands patelliform, flat or concave with tangential trough, rim of gland not thickened 72
71. Involucral glands cupuliform, deeply sunken in the centre, usually with thickened rim 88
72. Styles entire or scarcely bifid; capsules broader towards the base; gland appendages ≥ 0.3 mm long (NT, Qld). 41. *E. petala*
72. Styles bifid for $1/3$ – $1/2$ of their length or if entire then capsules broader towards the middle or gland appendages absent or < 0.3 mm long 73
73. Stipules on at least one side of stem triangular to broadly triangular, with toothed margins but not deeply bipartite 74
73. Stipules deeply bipartite, with lobes subulate to triangular 76
74. Gland appendages < 0.4 mm long and < 0.8 mm wide; staminate flowers per cyathium ≤ 10 ; hypogynous disc often laciniate (all mainland States). 14. *E. dallachyana*
74. Gland appendages ≥ 0.4 mm long and ≥ 0.8 mm wide; staminate flowers per cyathium mostly > 10 ; hypogynous disc entire 75
75. Leaf blades oblong to oblong-elliptic, > 1.5 times as long as wide; seeds < 1.5 mm long (Qld). 25. *E. laciniloba*
75. Leaf blades elliptic to broad-elliptic, ≤ 1.5 times as long as wide; seeds > 1.5 mm long (Qld) 36. *E. ophiolitica*
76. Gland appendages < 0.2 mm long or absent 77
76. Gland appendages ≥ 0.2 mm long 83
77. Capsules > 2 mm long; stems ascending to erect, rarely prostrate; staminate flowers per cyathium 10–30; styles 0.5–0.9 mm long (WA) 33. *E. myrtoides*
77. Capsules ≤ 2 mm long; stems prostrate rarely erect; staminate flowers per cyathium 5–15; styles 0.2–0.6 mm long 78
78. Styles entire, 0.2–0.3 mm long (NSW, Qld, SA, Vic, WA). 32. *E. multifaria*
78. Styles bifid for $1/3$ – $1/2$ of their length, 0.3–0.6 mm long 79
79. Leaves minutely papillose (visible at $40\times$ mag.) 80
79. Leaves \pm smooth 81
80. Involucral glands well developed, 0.1–0.3 mm long and 0.3–0.5 mm wide; gland appendages ≥ 0.1 mm long (NSW, Qld) 40. *E. papillifolia*
80. Involucral glands poorly formed up to 0.1 mm long and 0.1–0.2 mm wide; gland appendages absent or < 0.1 mm long (NSW, NT, Qld, SA, WA) 23. *E. inappendiculata*
81. Stipules ≥ 1 mm long; involucral glands up to 0.1 mm long (NSW, NT, Qld, SA, WA). 23. *E. inappendiculata*
81. Stipules < 1 mm long; involucral glands > 0.1 mm long. 82
82. Dorsal faces of seeds undulate or obscurely ridged; seeds 1–1.5 mm long, growing in sandy soils on rocky limestone foreshores and coastal sand dunes (north-western WA) 50. *E. sharkoensis*
82. Dorsal faces of seeds distinctly ridged; seeds 1.5–1.7 mm long; growing on inland sand dunes in the Great Victoria Desert (NT, SA, WA) 57. *E. victoriensis*

- 83 Capsules minutely papillose (visible at 40× mag.); stems not longitudinally ridged (SA) **18. E. flindersica**
83. Capsules smooth, or if minutely papillose then stems longitudinally ridged when young **84**
- 84 Staminate flowers <10 per cyathia or if 10 then capsules ≤2 mm long; seeds <1.5 mm long **85**
84. Staminate flowers >10 per cyathia or if 10 then capsules >2 mm long; seeds ≥1.5 mm long **86**
- 85 Leaves ± smooth; growing in sandy soils on rocky limestone foreshores and coastal sand dunes (north-western WA) **50. E. sharkoensis**
85. Leaves minutely papillose (visible at 40× mag.); growing in clay soils (mostly derived from basalt) in central Queensland (NSW, Qld) **40. E. papillifolia**
- 86 Leaf blades elliptic to broad elliptic; 1–1.5 times as long as wide (Qld) . **36. E. ophiolitica**
86. Leaf blades oblong, ovate, obovate or oblong-elliptic, 1.5–2.2 times as long as wide **87**
- 87 Capsules ≥2.2 mm long; involucral glands 0.3–0.6 mm long; plants to 40 cm tall, monoecious; stems spreading to erect rarely prostrate; leaves bright green to yellow-green (WA) **33. E. myrtoides**
87. Capsules <2.2 mm long; involucral glands 0.2–0.4 mm long; plants to 10 cm tall, mostly dioecious; stems prostrate to spreading; leaves blue-green (NSW, Qld) **40. E. papillifolia**
- 88 Stipules on at least one side of stem broadly triangular, not deeply bipartite; hypogynous disc mostly lacinate; stems prostrate, rarely erect or ascending (all mainland States) **14. E. dallachyana**
88. Stipules subulate to triangular, deeply bipartite; hypogynous disc mostly entire; stems ascending to erect or prostrate **89**
- 89 Gland appendages ≥0.1 mm long **90**
89. Gland appendages <0.1 mm long or absent **100**
- 90 Capsules broadest towards the base **91**
90. Capsules broadest towards the equator **94**
- 91 Dorsal faces of seeds with medial irregular longitudinal ridge (NSW, NT, Qld, SA, WA) **43. E. porcata**
91. Dorsal faces of seeds irregularly ridged but without medial longitudinal ridge **92**
- 92 Styles entire or scarcely bifid at the tip (NT, Qld) **41. E. petala**
92. Styles bifid for 1/3–1/2 of their length **93**
- 93 Dorsal faces of seed with low faint irregular ridges; plants usually robust herbaceous perennials to 30 cm tall; stems erect rarely prostrate; gland appendages 0.2–0.4 mm long (NT, WA) **2. E. albrechtii**
93. Dorsal faces of seeds with prominent irregular ridges; plants slender herbaceous perennials to 15 cm tall; stems prostrate rarely ascending; gland appendages 0.1–0.3 mm long (NT, WA) **42. E. philochalix**

- 94 Leaf blades ≥ 3 times as long as wide; seeds 0.8–1.3 mm long, distinctly or obscurely irregularly ridged; styles scarcely bifid to divided *c.* 1/3 of their length; involucral glands 0.3–0.5 mm wide (NT, Qld, WA) **20. *E. hassallii***
94. Leaf blades < 3 times as long as wide or if up to 3.3 times as long as wide then either seeds > 1.3 mm long and obscurely irregularly ridged, or styles entire, or involucral glands < 0.2 mm wide **95**
- 95 Seeds < 1.2 mm long or if ≥ 1.2 then dorsal faces of seeds with a medial longitudinal ridge **96**
95. Seeds ≥ 1.2 mm long; dorsal faces of seeds smooth or with irregular ridges **98**
- 96 Styles entire; capsules minutely papillose; stems longitudinally ridged (NT, Qld) **39. *E. papillata***
96. Styles divided for 1/3–1/2 of their length; capsules smooth; stems not longitudinally ridged **97**
- 97 Dorsal faces of seeds irregularly ridged (NSW, NT, Qld, SA, WA) **23. *E. inappendiculata***
97. Dorsal faces of seeds with a medial longitudinal ridge (NSW, NT, Qld, SA, WA) **43. *E. porcata***
- 98 Styles entire, 0.1–0.3 mm long; capsules papillose (NT, Qld) **39. *E. papillata***
98. Styles divided for 1/3–1/2 of their length, 0.3–0.5 mm long; capsules smooth or papillose **99**
- 99 Erect annual to 40 cm tall; exotesta of uneven thickness, always thicker on ridges; involucral lobes > 0.4 mm long (NT) **19. *E. gregoriensis***
99. Prostrate to procumbent perennial; exotesta of even thickness; involucral lobes < 0.4 mm long (Qld) **40. *E. papillifolia***
- 100 Gland appendages absent; involucral glands well developed 0.2–0.3 mm long and 0.4–0.5 mm wide with conspicuous thickened rim; leaf blades > 3 times as long as wide and > 7 mm long (NT, Qld) **13. *E. crassimarginata***
100. Gland appendages usually present but inconspicuous or if absent then either leaf blades < 3 times as long as wide and mostly < 7 mm long or involucral glands poorly formed up to 0.1 mm long and 0.1–0.2 mm wide; involucral glands with or without thickened rim **101**
- 101 Dorsal surface of seeds with 6–9 transverse ridges; exotesta of uneven thickness, always thicker on ridges (WA) **17. *E. fitzroyensis***
101. Dorsal faces of seeds with irregular ridges, or tuberculate or if transversely ridged then with 3–6 ridges on dorsal faces of seed; exotesta \pm of even thickness over seed surface **102**
- 102 Styles entire or scarcely notched at the apex, 0.2–0.3 mm long; dorsal surface of seeds distinctly transversely or irregularly ridged; capsules broadest towards the middle **103**
102. Styles bifid for 1/3–2/3 of their length or if entire or scarcely notched at the apex then either dorsal faces of seeds obscurely undulate or capsules broadest towards the base; styles 0.2–0.6 mm long **105**

- 103 Leaves <6 mm long; stems not longitudinally ribbed; dorsal face of seeds irregularly ridged; exotesta of uneven thickness over seed surface (thicker on ridges) (NSW, Qld, SA, Vic, WA) **32. E. multifaria**
103. Leaves ≥6 mm long or if <6 mm long then stems longitudinally ribbed, dorsal faces of seeds with 3–6 transverse ridges and exotesta of ± even thickness over surface **104**
- 104 Leaves rounded at apex; dorsal faces of seeds with 3–6 transverse ridges (NSW, NT, Qld, WA) **15. E. drummondii**
104. Leaves acute to obtuse at apex, or if rounded then dorsal faces of seeds with irregular ridges (NT, Qld, WA) **20. E. hassallii**
- 105 Stipules subulate, 1–1.7 mm long; involucre glands poorly formed up to 0.1 mm long and 0.1–0.2 mm wide (NSW, NT, Qld, SA, WA). **23. E. inappendiculata**
105. Stipules narrow-triangular to triangular or if subulate then ≤1.1 mm long; involucre glands well formed, 0.1–0.2 mm long by 0.1–0.7 mm wide **106**
- 106 Largest leaves >8 mm long, mostly >3 times as long as wide (NT, Qld, WA) **20. E. hassallii**
106. Largest leaves <8 mm long, <3 times as long as wide **107**
- 107 Dorsal faces of seeds with an irregularly medial longitudinal ridge (NSW, NT, Qld, SA, WA). **43. E. porcata**
107. Dorsal faces of seeds undulate, faintly irregularly ridged or with irregular wart-like protuberances. **108**
- 108 Dorsal faces of seeds with irregular wart-like protuberances (NSW, SA, WA). **55. E. verrucitesta**
108. Dorsal faces of seeds undulate or only faintly irregularly ridged (NSW, Qld, SA, Vic, WA) **32. E. multifaria**

1. Euphorbia accedens Halford & W.K.Harris, *species nova* fieri potest, ut *E. accedens* permisceatur cum *E. australi* var. *hispidula* Halford & W.K.Harris et *E. thelephora* var. *rugosa* Halford & W.K.Harris. Ab *E. australi* var. *hispidula* seminibus longioribus 1.3–1.4 mm longis (in vicem 0.9–1.2 mm longis), 5–7 porcis ± transversis rotundatus superficialium dorsalium seminis (in vicem undulatis vel porcatis leviter irregulatim), stylis integris vel vix bifidis (in vicem bifidis 1/3–2/3 longitudinis) necnon ab *E. thelephora* var. *rugosa* seminibus brevis 1.3–1.4 mm longis (in vicem 1.5–1.7 mm longis), capsulis in latere visis lato-ellipticus ± longioribus quam latioribus 1.6–2 mm longis 1.9–2.2 mm latis (in vicem in latere visis 1.8–2.2 mm longis 1.4–1.8 mm latis distincte longioribus quam latioribus) differt. *Euphorbia accedens* formis *E. schultzei* Benth. similis sed capsulis in latere visis ± longioribus quam latioribus 1.6–

2 mm longis 1.9–2.2 mm latis leviter 3-lobatis (in vicem in latere visis depresso ovatis vel transverse ellipticis distincte brevioribus quam latioribus valde 3-lobatis), seminum superficiebus porcis transversis rotundatis vel porcatis irregulariter (in vicem 3–5 porcis) marginibus folium integris distaliter dentatis minute (in vicem marginibus folium pro parte maxima dentatis grosse) differt. **Typus:** Queensland. BURKE DISTRICT: Undilla Station, NW of Mt Isa, 18 July 2008, R.Booth & D.T.Kelman CAM36-7 (holo: BRI).

Monoecious, herbaceous perennial to 5 cm high, with few to many stems arising from thickened woody taproot. **Stems** erect or prostrate, sparingly to much branched, smooth, with a moderately dense indumentum; hairs spreading, ± straight, 0.2–0.8 mm long, white. **Interpetiolar stipules** subulate, 0.3–0.5 mm long, deeply bipartite, with indumentum as for stems; margin entire

or lacinate. **Leaves:** petiole 1–1.5 mm long, smooth, with indumentum as for stems; blade oblong or oblong-obovate, 5–12 mm long, 3–6 mm wide, 1.5–2.5 times longer than wide; adaxial and abaxial surfaces pale blue-green sometimes suffused with reddish tinge or reddish tinge along margin, papillose, with a moderately dense indumentum consisting of spreading, \pm straight hairs 0.2–0.8 mm long; base asymmetric with one side cordate, the other obtuse to cuneate; margin entire or minutely toothed distally; apex obtuse to rounded sometimes with apiculate tip. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles 0.1–0.4 mm long. **Involucres** cupuliform, 0.8–1.1 mm long, 1–1.2 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin fimbriate; glands 4, stipitate, cupuliform, with distinct tangential trough and thickened rim, transverse-oblong in outline, 0.2–0.3 mm long, 0.3–0.5 mm wide, yellow or pink; gland appendages conspicuous, spreading radially, very broad-obovate or transverse-oblong, 0.2–0.5 mm long, 0.3–0.8 mm wide, white to pink, glabrous, margin entire, erose or shallowly lobed; bracteoles 0.8–0.9 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into numerous subulate glabrous or hirsute segments. **Staminate flowers** 4–7 per cyathium; pedicels 0.6–0.8 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.5 mm long, spreading, minutely papillose, sparsely hairy, entire or scarcely bifid, with terete apices. **Capsules** exserted from involucre on pedicel to 1.5 mm long, broad-elliptic in lateral view, 1.6–2 mm long, 1.9–2.2 mm across, shallowly 3-lobate with keels acute, papillose, with a moderately dense indumentum consisting of spreading hairs 0.1–0.2 mm long; hypogynous disc entire. **Seeds** ovate in outline, 1.3–1.4 mm long, 0.7–0.8 mm tangentially, 0.7–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces planar to concave; all faces with 5–7 prominent \pm transverse, rounded ridges; exotesta thin, of uneven thickness, distinctly thicker on ridges, grey-white, microreticulate, becoming

mucilaginous when moistened; endotesta dark brown. **Fig. 1.**

Additional selected specimens examined: Northern Territory. Cattle Creek Stud, Wave Hill, Apr 1963, *Napier s.n.* (DNA 10288); c. 75 km NW of Lake Surprise, Aug 1991, *Latz 12167* (NT); c. 66 km N [of] Tennant Creek, upper Attack Creek catchment, May 1996, *Albrecht 7628 & Latz* (NT); near Alroy Downs Station, May 1947, *Blake 17889* (BRI, DNA); 24 km NW of Wauchope Roadhouse, gas pipeline, Jun 2007, *Latz 22770* (NT). **Queensland.** BURKE DISTRICT: Flora Downs Station, c. 120 km NW of Mt Isa, May 2001, *Bailey & Kelman s.n.* (BRI [AQ697493]); Lake Julius Road, 24 km to Mt Isa Copper stack at 58deg., Apr 1998, *Fell 5346* (BRI); Fort Constantine Station, N of Cloncurry, Jun 2003, *Booth 3401 & Kelman* (BRI); 90 km SSW of Cloncurry on the Duchess Road, Feb 2001, *Wannan 2071 & Jago* (BRI). GREGORY NORTH DISTRICT: 10 miles [c. 16 km] N of Duchess, May 1963, *Gittins 731* (BRI, NSW).

Distribution and habitat: *Euphorbia accedens* occurs from the Tanami Desert, NT to Cloncurry, in north-western Qld (**Map 1**). It grows in eucalypt woodland or *Triodia* grassland communities on loam or clay soils on low limestone rises or hills, or sometimes on alluvial plains.

Phenology: Flowers and fruits have been collected in February, April to June, August and November.

Notes: *Euphorbia accedens* may be confused with *E. australis* var. *hispidula* Halford & W.K.Harris and *E. thelephora* var. *rugosa* Halford & W.K.Harris. It differs from *E. australis* var. *hispidula* in having longer seeds (1.3–1.4 mm long versus 0.9–1.2 mm long for *E. australis* var. *hispidula*), 5–7 prominent \pm transverse, rounded ridges on the dorsal seed faces (versus undulate or faintly irregular ridged for *E. australis* var. *hispidula*) and entire or scarcely bifid styles (versus bifid for 1/3–2/3 of their length for *E. australis* var. *hispidula*). It differs from *E. thelephora* var. *rugosa* in having shorter seeds (1.3–1.4 mm long versus 1.5–1.7 mm long for *E. thelephora* var. *rugosa*) and capsules broad-elliptic in lateral view that are more or less as long as wide, 1.6–2 mm long, 1.9–2.2 mm across (versus elliptic in lateral view, 1.8–2.2 mm long, 1.4–1.8 mm across and distinctly longer than wide for *E. thelephora* var. *rugosa*).

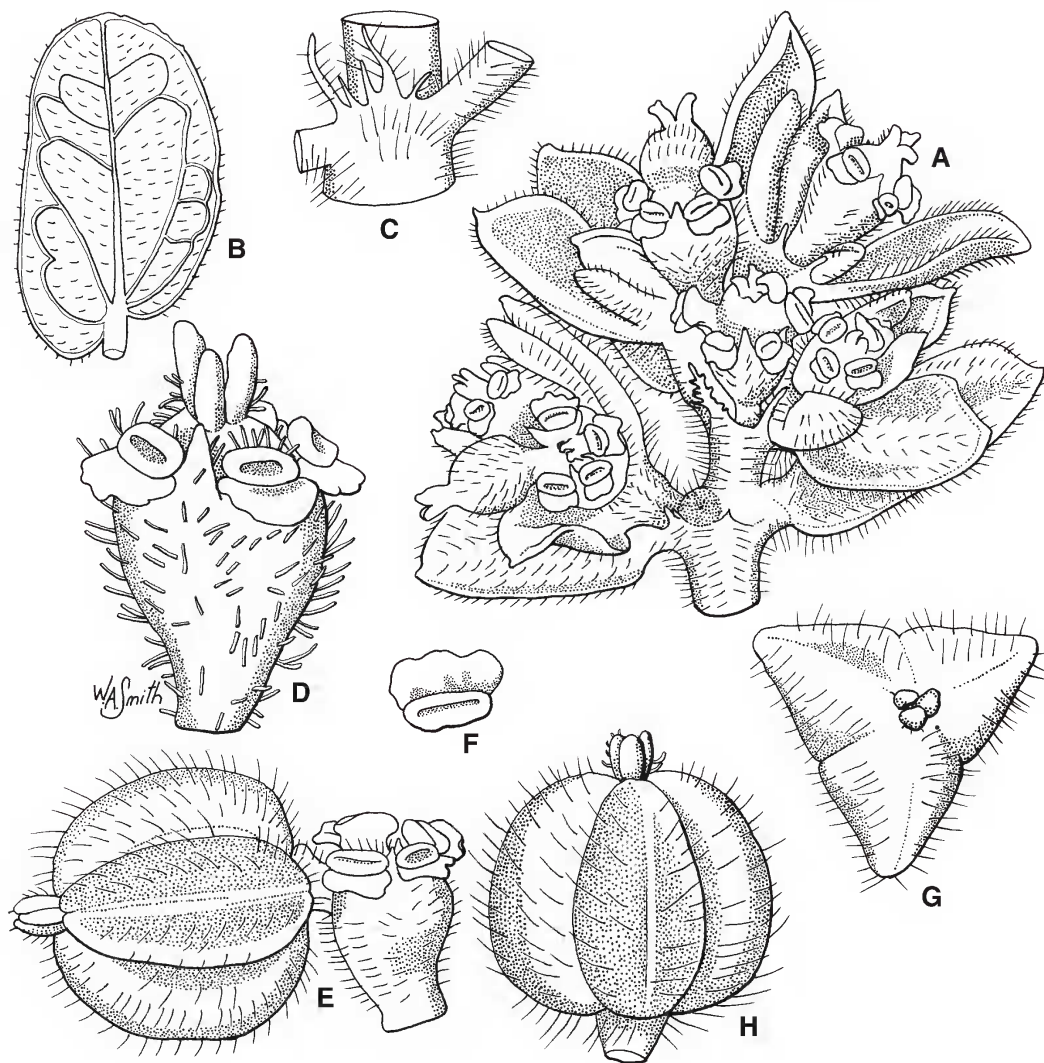


Fig. 1. *Euphorbia accedens*. A. branchlet with cyathia $\times 12$. B. leaf $\times 4$. C. stipules $\times 16$. D. cyathia with female flower at anthesis $\times 32$. E. capsule with cyathia $\times 16$. F. cyathial gland, adaxial view $\times 32$. G. capsule, top view $\times 16$. H. capsule, lateral view $\times 16$. A, D from *Gittins 731* (BRI); B, C, E–H from *Booth & Kelman CAM36-7* (BRI). Del. W.Smith.

Euphorbia accedens is similar to some forms of *E. schultzei* but differs in having capsules broad-elliptic in lateral view that are more or less as long as wide, 1.6–2 mm long, 1.9–2.2 mm across and shallowly 3-lobate (versus depressed ovate or transversely elliptic in lateral view and distinctly shorter than wide, 1.5–2.2 mm long, 2–3 mm across, deeply 3-lobate for *E. schultzei*), seed surface with 5–7 prominent \pm transverse, rounded

ridges or irregularly ridged (versus 3–5 ridges for *E. schultzei*) and leaf margins entire or minutely toothed distally (versus leaf margins mostly coarsely toothed for *E. schultzei*).

Etymology: The specific epithet is from Latin *accedens*, an indeclinable participle meaning approaching, coming near to, or resembling. This alludes to this species' similarity to the taxa *E. australis* var. *hispidula* and *E. thelephora* var. *rugosa*.

2. *Euphorbia albrechtii* Halford & W.K.Harris, **species nova** arcte similis *E. cinerea* W.Fitzg. et *E. petalae* Ewart & L.R.Kerr glandis involucri albis capsulis seminibus sed a duobus habitu robustiore et stylis 1/3–1/2 longitudinis dividis differt. Insuper ab *E. cinerea* glandulae appendicibus longioribus capsulis seminibusque grandioribus et ab *E. petalae* glandulae appendicibus brevioribus floribus staminalibus paucioribus in quoque cyathio differt. Nomen *E. drummondii* saepe misapplicatum pro eam. *Euphorbia albrechtii* autem ab illa glandulae appendicibus grandioribus 0.2–0.4 mm longis (in vicem <0.1 mm longis) capsulis latissimis versus basim acute carinatis (ad vicem latissimis ad aequatorem carinatis obtuse) habitu robustiore seminibus porcatis irregulariter (in vicem superficies praeditis porcis distinctis transversis) differt. **Typus:** Northern Territory. 8 km NE [of] Bloods Range Outstation, 1 October 2001, D.E.Albrecht 10075 (holo: NT).

Monoecious, herbaceous perennial to 30 cm high, many stems arising from crown of thick cylindrical taproot, the whole plant glabrous. **Stems** erect to ascending (rarely prostrate), sparingly to much branched, longitudinally ridged when young. **Interpetiolar stipules** subulate or narrow-triangular, 0.5–1.1 mm long, deeply bipartite to base, glabrous; margin lacinate. **Leaves:** petiole 0.5–0.6 mm long, smooth; blade narrow-oblong, oblong or obovate, 6–9 mm long, 2.3–4 mm wide, 1.8–3 times longer than wide, smooth, green sometimes with reddish tinge on margin; base asymmetric with one side rounded to cordate, the other rounded; margin sparingly minutely toothed distally; apex rounded. **Cyathia** solitary at the nodes, often appearing clustered on short leafy lateral branchlets with subtending leaves usually slightly smaller than primary stem leaves; peduncles c. 0.3 mm long. **Involucre**s campanulate or turbinate, 0.8–1(–1.4) mm long, 0.7–1.1 mm across; lobes 5, triangular, 0.2–0.4 mm long, margin entire or fimbriate; glands 4, shortly stipitate, cupuliform, with distinct central pit, transverse-oblong in outline, 0.1–0.4 mm long, 0.4–0.7 mm wide, cream or red; gland appendages conspicuous, spreading radially,

reniform or depressed obovate, 0.2–0.4 mm long, 0.6–1 mm wide, pink to red or cream, glabrous, entire or shallowly lobed; bracteoles 0.4–0.6 mm long, adnate for c. 1/4 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** 2–5 per cyathium; pedicels 0.8–1.1 mm long; staminal filaments 0.1–0.3 mm long. **Pistillate flowers:** styles 0.3–0.5 mm long, spreading with recurved apices, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 2 mm long, broad to very broad-ovate in lateral view, 1.5–1.8 mm long, 1.7–2.2 mm across, shallowly 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 1–1.3 mm long, 0.5–0.8 mm tangentially, 0.5–0.7 mm radially, tetraquetrous in cross section; dorsal faces planar to concave; ventral faces concave; all faces with low faint irregular smooth ridges; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta red-brown **Figs 2, 25A.**

Additional selected specimens examined: Western Australia. Kimberley, May 1984, *Fatchen 965* (AD); just NW of Wolf Creek Crater, Apr 1979, *George 15290A* (BRI, PERTH); Great Sandy Desert, Tanami Track, c. 2 km W of NT – WA border, c. 225 km SE of Halls Creek, May 1976, *Beauglehole ACB51018* (PERTH); 82 km ESE of Telegraph Line on Ankatell Ridge Road, Aug 1977, *George 14822* (BRI, PERTH); Great Sandy Desert, May 1979, *George 15712* (BRI, PERTH); edge of Great Sandy Desert, c. 9 km by road ESE of edge of Gregory Range, at 106 km post WNW from Telfer Mine, Aug 1977, *Jackson 2984* (AD, HO, MEL); Lake Henern, May 1981, *Cane 46* (DNA); 9 miles [c. 14 km] W of Mt Webb, Jul 1967, *George 9037* (PERTH); Patience Well, Gibson Desert, Feb 2001, *Campbell 395* (PERTH); 10 miles [c. 16 km] N of Giles, Aug 1962, *Kuchel 107* (AD); Serpents Glen, Carnarvon Range, Little Sandy Desert, Aug 2001, *Kenneally K12165 & Edinger E2629* (PERTH); Everard Junction, Gibson Desert N.R., May 1988, *Pearson 395* (PERTH); 81 miles [c. 130 km] SW of Warburton Mission, Aug 1961, *George 2900* (PERTH). **Northern Territory.** Gibson Creek, c. 56 km N of Tennant Creek, July 1968, *Orchard 861* (AD, DNA); 28 miles [c. 45 km] W [of] Frewena R/H, Nov 1971, *Latz 1846* (DNA, NT); Lake Surprise, Mala Paddock near camp, Sep 1993, *Parsons 626* (DNA); Stuart Highway, between Tennant Creek and Barrow Creek, c. 11 km N of Wauchope, Jul 1964, *Eichler 17921* (AD); 6 km S [of] Camel Bore, Newhaven Reserve, May 2002, *Latz 18657* (NT); c. 6 km SW [of] Midway Bore, c. 38 km SE [of] Yuendumu,

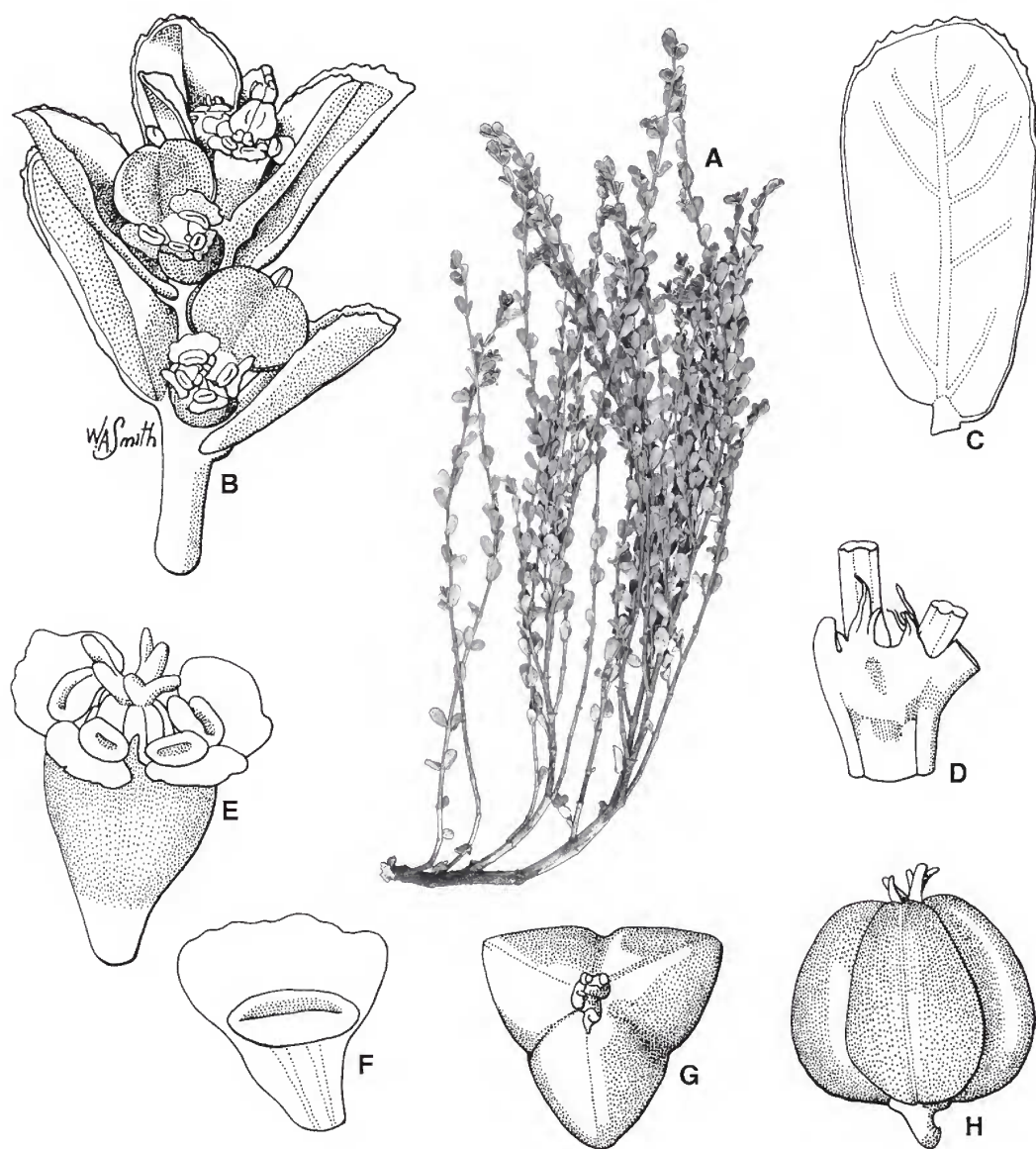


Fig. 2. *Euphorbia albrechtii*. A. habit $\times 0.5$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. stipules $\times 16$. E. cyathia with female flower $\times 24$. F. cyathial gland with appendage, adaxial view $\times 32$. G. capsule, top view $\times 16$. H. capsule, lateral view $\times 16$. A–C, E, F from *Albrecht 10075* (NT); D from *Albrecht 6304* (DNA); G, H from *Fatchen 965* (AD). Del. W. Smith.

Mar 1995, *Albrecht 6304* (DNA, MEL); 62 miles [c. 100 km] NNW of Alice Springs, Jun 1958, *Winkworth 1458* (DNA, NT); Hamilton Downs, No. 2 desert bore, Apr 1956, *Chippendale 2019* (DNA, MEL).

Distribution and habitat: *Euphorbia albrechtii* extends from the Little and Great Sandy Deserts, WA, eastward through the southern NT to the Qld border (**Map 2**). It grows in *Triodia* grassland communities on red sandy soils on sand plains, inland sand dunes or dune swales. It has often been noted on specimen labels to be growing in areas “recently burnt”.

Phenology: Flowers and fruits have been collected throughout the year, particularly from May to August.

Notes: *Euphorbia albrechtii* is most similar to *E. cinerea* and *E. petala* which have similar involucre glands, capsules and seeds. It differs from both species by having a more robust habit and styles divided for 1/3–1/2 of their length. It also differs from *E. cinerea* in having longer gland appendages and larger capsules and seeds. It differs from *E. petala* in having shorter gland appendages and fewer staminate flowers per cyathia. These differences are summarized in **Table 1**.

Table 1. Morphological comparison between *Euphorbia albrechtii*, *E. cinerea* and *E. petala*

Character	<i>E. albrechtii</i>	<i>E. cinerea</i>	<i>E. petala</i>
habit	robust erect herbaceous perennial rarely prostrate	slender prostrate herbaceous perennial	slender prostrate herbaceous perennial
involucre length (mm)	0.8–1	0.8–1	1.1–1.5
gland appendage length (mm)	0.2–0.4	0.1–0.3	0.3–1.3
staminate flowers per cyathium	2–5	1–5	7–10
style division	bifid for 1/3–1/2 of their length	entire	entire or scarcely bifid at the tip
capsule size (mm)	1.5–1.8 × 1.7–2.2	1.1–1.3 × 1.3–1.5	1.7–1.8 × 1.7–2.2
seed length (mm)	1–1.3	0.7–0.8	1–1.2

The name *Euphorbia drummondii* has often been applied to this species in the past. *E. albrechtii* differs in having larger gland appendages 0.2–0.4 mm long (versus <0.1 mm long for *E. drummondii*), capsules that are broadest towards the base and acutely keeled (versus broadest towards the equator and obtusely keeled for *E. drummondii*), more robust habit, and seeds with surfaces irregularly ridged (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*).

Etymology: The species is named in honour of botanist David E. Albrecht, Alice Springs Herbarium (1993–2012), who has made

significant contributions to our knowledge of the flora of Central Australia.

3. *Euphorbia armstrongiana* Boiss., in A.DC., *Prodr.* 15(2): 47–48 (1862). **Type:** [Northern Territory.] Port Essington, *s.d.*, [J.W.] *Armstrong 530* (lecto [here designated]: K 186465 [ex Herb. Hook.]; isolecto: K 186464 [ex Herb. Benth.]).

Monoecious, annual with lax habit to 60 cm high, few to several stems arising from slender taproot. **Stems** decumbent to erect (rarely prostrate, *Lazarides & Adams 146* [DNA]), sparingly to much branched, smooth, glabrous or sparsely to moderately

pilose with spreading white hairs 0.7–2.5 mm long. **Interpetiolar stipules** triangular, 0.3–0.6 mm long, entire or deeply bipartite to base, glabrous adaxially, hairy abaxially with straight stiff white hairs to 0.3 mm long; margin entire or lacinate. **Leaves:** petiole 1–2.3 mm long, smooth, glabrous or with indumentum as for stems; blade oblong, elliptic or occasionally broad-elliptic to rotund, 7–20 mm long, 5–10 mm wide, 1–2.2 times longer than wide; both surfaces smooth; adaxial surface green occasionally with reddish tinge, glabrous; abaxial surface pale green, glabrous or sparsely pilose with spreading, \pm straight hairs 0.9–1.1 mm long; base asymmetric with one side cordate, the other obtuse to rounded; margin entire or sparingly minutely toothed, sometimes only proximally; apex rounded to obtuse, sometimes minutely apiculate. **Cyathia** solitary at the upper nodes; peduncles 1–3.5 mm long. **Involucres** cupuliform, 0.9–1.4 mm long, 1.3–1.8 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin fimbriate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, 0.4–0.6 mm long, 0.6–1.1 mm wide, pale green; gland appendages conspicuous to inconspicuous, spreading radially, transverse-linear or lunate, 0.1–0.25 mm long, 0.9–1.3 mm wide, white or occasionally pink, glabrous, margin \pm entire; bracteoles 0.8–1 mm long, adnate for *c.* 1/2 of their length to involucre, free portion divided into numerous \pm linear hairy segments. **Staminate flowers** 18–22 per cyathium; pedicels 1.3–1.5 mm long; staminal filaments 0.4–0.5 mm long. **Pistillate flowers:** styles 0.7–0.9 mm long, connate at the base into a column for *c.* 1/4 of their length, erect, recurved distally, smooth, glabrous, each bifid for *c.* 1/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 5 mm long, very

broad-ovate in lateral view, 2.5–3 mm long, 2.8–3.8 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** broad-ovate in outline, 1.6–1.9 mm long, 1.2–1.4 mm tangentially, 1.1–1.4 mm radially, tetragonous in cross section; dorsal and ventral faces \pm planar, with 4–6 distinct transverse grooves; exotesta thin, \pm of even thickness over surface, pale brown or pale grey, micropapillate, not becoming mucilaginous when moistened; endotesta red-brown.

Distribution: *Euphorbia armstrongiana* extends from the Kimberley region, WA to north-western NT.

Typification: In his protologue of *E. armstrongiana*, Boissier (1862) states “Ad Port. Essington Australiae tropicae (Armstrong n. 530!).(v.s. in h. Kew.)”. Two sheets of the Armstrong collection have been located amongst material on loan to BRI from K, and are numbered (186464 ex Herbarium Benthamianum 1854) and (186465 ex Herbarium Hookerianum 1867) respectively. The specimen numbered 186465 is selected here as lectotype of *E. armstrongiana* as it is part of the original material, morphologically agrees with the protologue description and is the more ample of the two specimens.

Notes: *Euphorbia armstrongiana* is easily distinguished from all other species of *E.* sect. *Anisophyllum* in Australia by its very distinctive seed sculpturing and generally slender stems with elongated internodes. The seed surface is sulcate with 4–6 distinct transverse grooves (**Fig. 25B**).

As circumscribed here, *E. armstrongiana* exhibits discontinuous variation in branchlet indumentum associated with a geographical disjunction. These taxa are here recognised as varieties which can be distinguished using the following key.

Key to varieties of *Euphorbia armstrongiana*

- Stems hairy, sometimes only proximally **3a. *E. armstrongiana* var. *armstrongiana***
 Stems glabrous **3b. *E. armstrongiana* var. *distans***

3a. *Euphorbia armstrongiana* var. *armstrongiana*

Illustration: Dunlop *et al.* (1995: 218, fig. 72).

Stems with a sparse to moderately dense indumentum of spreading, \pm straight, white hairs 0.7–2.5 mm long.

Additional selected specimens examined: **Northern Territory.** Cobourg Peninsula, Smith Point, Mar 2002, *Risler & Firth 1773* (DNA); c. 25 km NE of Jabiru, Mar 1981, *Craven 6608* (AD, BRI, DNA); 10 km S of Oenpelli, Arnhem Land, May 1988, *Munir 5831* (AD); Litchfield N.P., Mar 1995, *Cowie 5323 & Taylor* (BRI); Mary River, May 1989, *Clarke 1776* (BRI); c. 6 miles [c. 10 km] N of Pine Creek township, Mar 1965, *Lazarides & Adams 146* (DNA, NSW); UDP [Gunlom] Falls, 108 km NE of Pine Creek (Waterfall Creek N.R.), May 1983, *Barker 506* (AD, NSW); Kakadu N.P., 19.1 km S of old Darwin road, along road to Pine Creek, Apr 1992, *Halford Q1124* (BRI); Kakadu Stage 3, Kambolgie Creek, Apr 1993, *Egan 2129* (BRI, DNA); Edith River area, Apr 1999, *Michell & Risler 2339* (DNA).

Distribution and habitat: *Euphorbia armstrongiana* var. *armstrongiana* occurs in north-western NT, in an area more or less bounded by the Cobourg Peninsula, Oenpelli, Katherine and Litchfield N.P. (**Map 3a**). It grows in eucalypt woodland/forest communities sometimes in *Allosyncarpia* forest communities on sandy soils mostly derived from sandstone. It is commonly found amongst boulders on sandstone plateaux, scree slopes, rocky hillsides or rocky crevices.

Phenology: Flowers and fruits have been collected from March to May.

3b. *Euphorbia armstrongiana* var. *distans* (W.Fitzg.) Halford & W.K.Harris **combinatio et status nova**; *Euphorbia distans* W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 3: 160 (1916). **Type:** Western Australia. Mount Broome, May 1905, *W.V.Fitzgerald 818* (lecto [here designated]; PERTH 2847248; isolecoto: NSW 98807).

Illustration: Wheeler (1992: figs 183C, 184F, 185F, 186F), as *Euphorbia distans*.

Stems glabrous.

Additional selected specimens examined: **Western Australia.** West Governor Island, Napier Broome Bay, May 1984, *Willis s.n.* (MEL 296755); West Montalivet Island, Bonaparte Archipelago, Jun 1992, *Kenneally 11216* (PERTH); ‘Shelly Beach Island’ in Prince Frederick Harbour, May 1987, *Kenneally 10008* (PERTH); fire plot

2, 15 km W of airstrip on Mitchell Falls track, Mitchell Plateau, Oct 1981, *Farrell 953* (PERTH); creek entering inlet of Talbot Bay, 23 km SE of Cockatoo Island, May 1983, *Fryxell & Craven 3889* (PERTH); Long Island, Buccaneer Archipelago, Jun 1982, *Hopkins BA136* (PERTH); Sunday Island, Buccaneer Archipelago, Jun 1982, *Hopkins BA7* (PERTH); Barker River Gorge, 4 km N of Mt Hart Station homestead, King Leopold Ranges, Jun 1988, *Edinger 611* (PERTH); Yellow Man Creek, 10 km NE of Mount Hart homestead, May 1998, *Kenneally 12145* (PERTH); Fern Creek, King Leopold Range, 1.3 km W of Mt Bell, May 1988, *Cranfield 6723* (PERTH).

Distribution and habitat: *Euphorbia armstrongiana* var. *distans* occurs in the Kimberley, WA, from Bonaparte Archipelago south to King Leopold Range (**Map 3b**). It grows in woodland communities along creeks, on hillslopes or on flat terrain on clay to sandy soils derived from granite, sandstone or basalt. It is also found growing in rock crevices in vine thicket communities and amongst coastal rocks on beach conglomerate or beach sand.

Phenology: Flowers and fruits have been collected from April to July with one collection in October.

Typification: Fitzgerald (1918) based his description of *Euphorbia distans* on material he collected from near Mt Broome in the Kimberley, WA. Two sheets of a collection made by Fitzgerald from Mt Broome have been located amongst material on loan to BRI from PERTH [2847248] and NSW [98807]. The sheet numbered 2847248 from PERTH is here chosen as lectotype because it is the best preserved and more ample of the two specimens and morphologically agrees with the protologue description of this species.

4. *Euphorbia australis* Boiss., *Cent. Euphorb.* 15 (1860); *Chamaesyce australis* (Boiss.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Western Australia.] baie des chiens marins [bay of the sea dogs (Shark Bay)], [September 1818], *C.Gaudichaud 1400* (holo: G-DC [G 149371] *n.v.* (image seen) (IDC microfiche 800-73. 2421: III. 1); iso: P 313100).

Monoecious, herbaceous perennial to 30 cm high, few to many stems arising from thickened taproot. **Stems** prostrate, ascending to erect, much branched, smooth, with a sparse to dense

indumentum; hairs spreading, \pm straight, 0.1–0.9 mm long, white. **Interpetiolar stipules** narrow-triangular, 0.5–1 mm long, deeply bipartite, with indumentum as for stems; margin lacinate. **Leaves:** petiole *c.* 1 mm long, smooth, indumentum as for stems; blade oblong, obovate or oblong-elliptic, 4–16 mm long, 2–9 mm wide, 1.5–2.4 times longer than wide; adaxial surface green or red, smooth or minutely papillose, glabrous or with a sparse to dense indumentum consisting of ascending to spreading, \pm straight hairs, 0.1–0.8 mm long; abaxial surface green or red, minutely papillose, with a sparse to dense indumentum as for abaxial surface; base asymmetric with one side cordate the other rounded; margin entire or toothed distally; apex rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves smaller than the primary stem leaves; peduncles 0.6–0.7 mm long. **Involucres** turbinate, 0.9–1.2 mm long, 0.9–1 mm across; lobes 5, triangular, 0.3–0.6 mm long, margin entire or ciliate; glands 4, stipitate, patelliform or cupuliform, concave or with shallow central pit, transverse-oblong or transverse-elliptic in outline, 0.1–0.3 mm long, 0.3–0.6 mm wide, red or yellow; gland appendages conspicuous to inconspicuous, spreading radially, transverse-oblong to obdeltoid, 0.1–0.4 mm long, 0.3–0.9 mm wide, red or yellow or creamy white, glabrous; margin dentate or irregularly lobed; bracteoles 0.5–1 mm long, adnate for *c.* 1/5 of their length to involucre, free portion entire or divided into numerous \pm subulate glabrous or hairy segments. **Staminate flowers** 5–10 per cyathium; pedicels 1–1.2 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.3–0.6 mm long, spreading and

recurved distally, smooth, glabrous, bifid for 1/3–2/3 of their length, with apices terete. **Capsules** exerted from involucre on pedicel to 2 mm long, \pm broad-elliptic in lateral view, 1.4–2 mm long, 1.5–2.1 mm across, shallowly 3-lobate with keels obtuse, smooth or minutely papillose, with a moderately dense to dense indumentum; hairs spreading, 0.1–0.7 mm long; hypogynous disc entire. **Seeds** broad-ovate in outline, 0.8–1.6 mm long, 0.6–0.9 mm tangentially, 0.6–0.9 mm radially, tetraquetrous in cross section; dorsal faces planar or convex; ventral faces planar or concave; all faces faintly to distinctly irregularly ridged or undulate; exotesta thin, of even thickness over surface, grey-white or brown, microreticulate, mostly becoming mucilaginous when moistened; endotesta red-brown.

Distribution and habitat: *Euphorbia australis* is widespread across the arid zone of Australia occurring in all mainland States excluding Vic.

Notes: *Euphorbia australis* is consistently hairy on most parts. It is most similar to *E. careyi*, *E. centralis* and *E. vaccaria*. For features distinguishing *E. australis* from those species, refer to the 'Notes' section under the species concerned.

As circumscribed here, this species is a morphologically variable complex that exhibits a wide range of variation in habit and length of indumentum, as well as variations in size of seeds, degree of serration of the leaf margin and degree of lobing on gland appendages. Four varieties are here formally recognised which can be distinguished using the following key.

Key to varieties of *Euphorbia australis*

- 1 Upper surface of leaf blades glabrous or rarely with a few scattered hairs. **4c. *E. australis* var. *glabra***
1. Upper surface of leaf blades sparsely to densely hairy. **2**
- 2 Leaf margins entire; plants moderately to densely villose; seeds \leq 1.3 mm long **4e. *E. australis* var. *subtomentosa***
2. Leaf margins toothed sometimes only distally; plants hispid to hispidulous, pilose or sparsely to densely villose; seeds 1–1.6 mm long **3**

- 3 Plants hispid to hispidulous; hairs on capsules mostly ≤ 0.3 mm long; dorsal faces of seed faintly irregularly ridged or undulate. **4d. *E. australis* var. *hispidula***
3. Plants villose or pilose; hairs on capsules >0.3 mm long; dorsal faces of seed distinctly irregularly ridged. **4**
- 4 Plants pilose to villose; leaf blades 9–16 mm long by 3–9 mm wide; cyathia mostly green; glands yellow to red; gland appendages often white to creamy yellow, shallowly lobed or toothed; grows in coastal and subcoastal areas **4a. *E. australis* var. *australis***
4. Plants villose; leaf blades 3.2–8 mm long by 2–5 mm wide; cyathia and glands red; gland appendages red, usually acutely toothed; grows in arid inland areas **4b. *E. australis* var. *erythrantha***

4a. *Euphorbia australis* var. *australis*

Herb to 10 cm high; stems usually prostrate, rarely ascending. Indumentum pilose to villose; hairs (0.2) 0.6–0.9 mm long. **Leaves** oblong to oblong-elliptic, 9–16 mm long, 3–9 mm wide, margin toothed distally, adaxial and abaxial surfaces pilose to villose. **Involucres** mostly green; glands 0.1–0.3 mm long, 0.3–0.5 mm wide, yellow to red; appendages transverse-oblong to obdeltoid, 0.1–0.2(0.4) mm long, 0.2–0.5(0.9) mm wide, shallowly to deeply lobed, mostly white to creamy yellow. **Capsules** 1.5–1.8 mm long, 1.8–2 mm wide; hairs 0.4–0.5 mm long. **Seeds** 1.1–1.6 mm long, 0.6–0.9 mm tangentially, 0.6–0.9 mm radially, with distinct irregular ridges on dorsal faces.

Additional selected specimens examined: **Western Australia.** Varanus Island, Lowendale Group, May 1991, *Thomson 3500* (DNA); Barrow Island, Oct 1980, *Buckley 6731* (PERTH); Sandy Island, Flying Foam Passage, Dampier Archipelago, May 1960, *Royce 6386* (PERTH); Burrup Peninsula, May 1991, *Thomson 3508* (PERTH); between Port Hedland & Mundabullangana Station, Feb 1962, *George 3345* (PERTH); Thevenard Island, W of Onslow, May 1960, *Royce 6367* (PERTH); North West Cape, Aug 1960, *George 1385* (PERTH); near Norcape Lodge, Exmouth, Jul 1977, *McFarland 2* (BRI, PERTH); Beagle Island, 50 miles [c. 80 km] NE of Onslow, May 1960, *Royce 6375* (PERTH); Ward Reef road due north of C platform, Thevenard Island, May 1990, *White MRW040* (PERTH); Thevenard Island, Jun 1988, *Long VL260* (DNA); Bay of Rest, William Preston Point, Exmouth Gulf, Aug 1980, *Kenneally 7377* (PERTH); 21 miles [c. 34 km] S of Learmonth, Jun 1961, *George 2447* (PERTH); 23 miles [c. 37 km] S of Learmonth, Aug 1960, *George 1264* (PERTH); 63 miles [c. 101 km] S of Learmonth, Aug 1960, *George 1426* (PERTH); 12 km E of Cape Cuvier, N of Carnarvon, Aug 1995, *Keighery & Gibson 883* (PERTH); Carnarvon – Quobba Road, c. 33 km N of Carnarvon, Jul 1969, *Wilson 8376* (PERTH); Carnarvon on Gascoyne River

bank, May 1995, *Cranfield 9682* (PERTH); Shark Bay, Peron Peninsula, S of Carnarvon, Sep 1940, *Blackall 4644* (PERTH); Bundegee Wash, Sep 1998, *Mitchell-Smith 41* (PERTH).

Distribution and habitat: *Euphorbia australis* var. *australis* occurs on the islands and coastal and subcoastal parts of north-western WA from near Port Hedland south to Peron Peninsula, Shark Bay (**Map 4a**). It grows on sandy soils on foreshores, coastal sandhills, creek banks or alluvial plains.

Phenology: Flowers and fruits have been collected sporadically throughout the year mostly from May to August.

4b. *Euphorbia australis* var. *erythrantha* (F.Muell.) Benth., *Fl. Austral.* 6: 48 (1873); *Euphorbia erythrantha* F.Muell., *Fragm.* 2: 152 (1861). **Type:** [New South Wales.] Barrier Range, [1860] Vict. Exped. [*H.Beckler s.n.*] (lecto [here designated]: MEL 1560386; isolecto: MEL 1560385).

Herb to 10 cm high; stems usually prostrate, rarely ascending to erect. Indumentum villose; hairs (0.2) 0.6–0.9 mm long. **Leaves** oblong, suborbicular to obovate, 3.2–8 mm long, 2–5 mm wide, margin toothed distally, adaxial and abaxial surfaces villose. **Involucres** mostly red; glands 0.1–0.2 mm long, 0.3–0.6 mm wide, red; appendages obdeltoid, 0.1–0.2(0.4) mm long, 0.2–0.5(0.9) mm wide, shallowly to deeply toothed, red. **Capsules** c. 1.8 mm long and 2 mm wide; hairs 0.4–0.6 mm long. **Seeds** with faint to distinct irregular ridges on dorsal faces, 1.2–1.6 mm long, 0.7–0.8 mm tangentially, 0.7–0.9 mm radially. $n = 11$.

Additional selected specimens examined: **Western Australia.** near Lake Hopkins, Jul 1967, *George 8895* (PERTH); Elder Creek, 2 miles [c. 3 km] W of Warburton, Aug 1962, *George 3830* (PERTH); Mt Eveline, E of Warburton, Aug 1962, *George 3886* (PERTH); just to N of Blackstone Range, Jun 1977, *Burbidge 20/77 & Fuller* (PERTH). **Northern Territory.** Thomas Reservoir, Apr 1987, *Thomson 1715* (DNA). **South Australia.** Evelyn Creek, c. 11 km E of Mt Willoughby homestead, Sep 1966, *Shaw 513* (AD); Evelyn Downs, Sep 1955, *Ising* (AD 966150252); 55 km S of Mt Willoughby homestead, May 1984, *Badman 1095* (AD); Balcanooka, near Nudlamutana Well, Oct 1967, *Eichler 19623* (AD); Arkaroola Station, Sep 1971, *Kuchel 2936* (AD); Mt Chambers, Oct 1975, *Whibley 5623* (AD); Paralana Hot Springs, Nov 1993, *Bates 35069* (AD); Mount Harper Island, Apr 1993, *Bates 31973* (AD); c. 3 km E of Aroona Dam, Sep 1972, *Lothian 5229* (AD). **New South Wales.** 9 miles [c. 14 km] N of Silverton, May 1973, *Hassall 7314* (BRI); Broken Hill, Sep 1919, *Morris 7* (BRI); McDougalls Well, N of Broken Hill, Mar 1972, *Milthorpe 708* (NSW); Mundi Mundi Creek, May 1979, *Fox 7905006* (NSW); Conservation paddock, Fowler's Gap Station, c. 16 km SSW of Lake Bancannia, Aug 1973, *Cunningham 1345 & Milthorpe* (NSW); back paddock, Gnalta Station, 95 miles [c. 153 km] NE of Broken Hill, Sep 1973, *Cunningham 1197 & Milthorpe* (NSW).

Distribution and habitat: *Euphorbia australis* var. *erythrantha* occurs in the southern arid zone where it extends from Warburton, WA, through SA to White Cliffs, in western NSW (**Map 4b**). It grows mostly in bare open areas or in open shrubland communities on rocky or stony slopes of sandstone, limestone or granite, stony plains, or in rock crevices on breakaway cliffs. The soils are mostly skeletal to shallow red brown clay loams, clays or occasionally sands.

Phenology: Flowers and fruits have been collected throughout the year.

Typification: In the protologue of *Euphorbia erythrantha*, Mueller (*loc. cit.*) cited “In deserto circum montes Barrier Range. Dr Beckler”. Two sheets considered to be part of the collections used by Mueller have been located in material on loan to BRI from MEL, **a**: “near Barrier Range, Beckler” [MEL 1560385]; **b**: “Barrier Range, Vict. Exped.” [MEL 1560386]. Both sheets have a blue label attached with the name *E. erythrantha* written in Mueller's hand. The material on these sheets agrees with the description in the protologue and it is considered to be type material. Sheet MEL 1560386 is chosen as the

lectotype for *E. erythrantha* because it is the more ample specimen.

Dr Hermann Beckler was the medical officer and botanist to the original Burke and Wills, Victorian Exploration Expedition in 1860. Willis (1962) noted that Beckler never reached the Barrier Range and that Mueller and Bentham incorrectly assign many of Beckler's collections from the Scrope Range (c. 90 km E of the Barrier Range) to this locality.

Notes: *Euphorbia australis* var. *erythrantha* is similar to *E. australis* var. *subtomentosa* with its villose indumentum and red cyathia, glands and gland appendages. It differs in having toothed leaf margins and mostly acutely toothed gland appendages.

It can be difficult to distinguish between *E. australis* var. *erythrantha* and some forms of *E. centralis* with which it is sympatric in parts of eastern WA and northern SA. For features distinguishing *E. australis* var. *erythrantha* from *E. centralis*, refer to the ‘Notes’ section under that species.

4c. *Euphorbia australis* var. *glabra* Halford & W.K.Harris, **varietas nova** arcte similis *E. australi* var. *subtomentosae* Domin quoad indumentum et formam foliorum. Ab omnibus aliis varietatis *E. australis* superficie foliorum supra glabris differt. **Typus:** Western Australia. Hamersley Range National Park, 4.2 km along Mt Bruce homestead (abandoned) track from Marandoo East Road, 14 May 1980, *M.Trudgen 2579* (holo: PERTH; there are three unmounted duplicates (isotypes) with the holotype sheet).

Herb; stems prostrate. Indumentum pilose; hairs 0.4–1.3 mm long. **Leaf blades** elliptic to broadly elliptic, 3–8 mm long, 2–6 mm wide, margin entire; adaxial surface glabrous or rarely with a few scattered pilose hairs; abaxial surface pilose. **Involucres** mostly green; glands 0.1–0.2 mm long, 0.3–0.6 mm wide, pale green or red; appendages transverse-oblong or obdeltoid, 0.2–0.3 mm long, 0.5–0.6 mm wide, entire, mostly pink. **Capsules** 1.7–2 mm long, 1.6–2.1 mm wide; hairs 0.5–0.7 mm long. **Seeds** with low faint irregular ridges on dorsal faces, 1.4–1.5 mm

long, 0.7–0.8 mm tangentially, 0.8–0.9 mm radially.

Additional specimens examined: Western Australia. Erallinga Pool, Hamersley Ranges, Apr 1997, *Trudgen MET18971* (PERTH); Caves Creek, Mt Brockman Road, 50 km W of Hamersley Station homestead, Sep 2006, *Halford Q9256A* (BRI); Karijini N.P., Mt Bruce Flats, 13 km E of Marandoo Hill, 7.3 km SE of Mt Bruce, 9.3 km S of Mt Oxe, 5.7 km W of Mt Howieson, Hamersley Range, Mt Bruce S, Sep 1998, *van Leeuwen 3861* (BRI).

Distribution and habitat: *Euphorbia australis* var. *glabra* is restricted to the Hamersley Range, Pilbara, WA where it is known only from a few scattered localities (**Map 4c**). It grows on banks of semi-permanent pools or creeklines, or alluvial flats, in *Eucalyptus camaldulensis* Dehnh. open forest or *E. victrix* L.A.S. Johnson & K.D. Hill low forest on sandy to clayey-loam alluvium.

Phenology: Flowers and fruits have been collected from April to June and September.

Notes: *Euphorbia australis* var. *glabra* is most similar to *E. australis* var. *subtomentosa* in indumentum and leaf shape. It differs from all varieties of *E. australis* by its glabrous upper leaf surface.

Etymology: The varietal epithet is from Latin *glaber*, glabrous, in reference to the lack of indumentum on the adaxial surface of the leaves of this variety.

4d. *Euphorbia australis* var. *hispidula* Halford & W.K. Harris, **varietas nova** ab aliis varietatis *E. australis* differt a combinatiore characterum sequente: indumentum caulium foliorum capsularum undique hispidulosum usque hispidum, margines foliorum distale dentatae, pili in capsulis usque 3 mm longis, superficies dorsales seminum porcatae leviter irregulariter vel undulatae. **Typus:** Western Australia. Mt Nameless, near Tom Price, 22 September 2006, *D. Halford Q9240* (holo: BRI; iso: MEL, PERTH, *distribuendi*).

Herb to 30 cm high; stems prostrate, rarely ascending to erect. Indumentum on stem and leaves hispidulous to hispid, moderately dense with hairs 0.1–0.6 mm long. **Leaves** oblong, oblong-elliptic or oblong-obovate, 4–10 mm long, 2–6 mm wide; margin toothed distally. **Involucres** mostly red; glands *c.* 0.1 mm

long, 0.2–0.3 mm wide; gland appendages transverse-oblong, shallowly to deeply lobed, 0.1–0.2 (0.4) mm long, 0.2–0.5 (0.9) mm wide. **Capsules** 1.4–1.9 mm long, 1.5–2.1 mm wide; hairs 0.1–0.3 mm long. **Seeds** faintly irregularly ridged or undulate, 0.9–1.2 mm long, 0.6–0.8 mm tangentially, 0.6–0.8 mm radially.

Additional selected specimens examined: Western Australia. Djaluwon Creek, near S end of Lake Gregory, Apr 1979, *George 15376* (PERTH); 27 miles [c. 43 km] N of Lookout Rocks, May 1947, *Royce 1855* (PERTH); 10.9 km S of the Mt Bruce turnoff on the Wittenoon to Nanutarra Road, Sep 1991, *Trudgen MET10610 & Maley* (PERTH); Mt Nameless, near Tom Price, Jul 1980, *Atkins 838* (PERTH); *c.* 35 km W along Mt Brockman Road from Hamersley Station homestead, Sep 2006, *Halford Q9259* (BRI); 6 km W of Mujina Claypan, and 20 km ENE of Mt Windell, Feb 1987, *Mollemans 2306* (AD, PERTH); Hamersley Range N.P., 16.4 km from Milli Milli Springs on the track to Coppin Pools, May 1980, *Trudgen 2443/a* (PERTH); 3.25 km WSW of Packsaddle Hill, Hamersley Ranges, Jul 1997, *Trudgen 16711* (PERTH); 21 km N of Juna Downs homestead, Aug 1973, *Trudgen 380 & Merton* (PERTH); Hamersley Range N.P., above Dales Gorge, Aug 1974, *Carr 4823 & Beaglehole 48601* (NSW); *c.* 45 km NE of Tom Price along Karijini Drive, W of Marandoo, Sep 2006, *Halford Q9207* (BRI); *c.* 30 km W along Karijini Drive from Ranger Station, Karijini N.P., Sep 2006, *Halford Q9201* (BRI); 4.5 km SSE of West Angela Hill, Hamersley Ranges, Jul 1997, *Trudgen 16723* (PERTH); Little Sandy Desert, Apr 1979, *Mitchell 579* (DNA, PERTH); Little Sandy Desert, Apr 1979, *Mitchell 663* (PERTH). Northern Territory. 7 km NW [of] Tanami Mine, Sep 1990 *Latz 11821* (MEL, NT); Warrego, May 1993, *Egan 2214* (DNA); Tennant Creek, Mary Ann Dam, May 1993, *Egan 2267* (DNA); 35.5 miles [c. 57 km] NNW of Wauchope township, Aug 1956, *Lazarides 5850* (MEL, NSW); Devil's Marbles, Jun 1955, *Chippendale 1912* (DNA, NSW).

Distribution and habitat: *Euphorbia australis* var. *hispidula* occurs from near Tom Price, Pilbara, WA to Tennant Creek, NT (**Map 4d**). It grows in open *Triodia* grassland or *Acacia*/mallee shrubland with *Triodia* sp. in the understorey on skeletal stony or gravelly clay loams on ironstone hills or ridges, or on sandy to loam soils on sandplains.

Phenology: Flowers and fruits have been collected from April to October.

Notes: *Euphorbia australis* var. *hispidula* differs from the other varieties of *E. australis* by the following combination of characters: the indumentum is hispidulous to hispid on stems, leaves and capsules, leaf margins

toothed distally, hairs on capsules up to 0.3 mm long and dorsal faces of seeds faintly irregularly ridged or undulate.

Etymology: The varietal epithet is from Latin *hispidus*, hispid (covered with erect, rigid hairs), in reference to the indumentum on most surfaces of the variety.

4e. *Euphorbia australis* var. *subtomentosa* Domin, *Biblioth. Bot.* 89(4): 310 (1927 '1926').

Type: Western Australia. Inter Ashburton et De Gray River *s.d.*, *E. Clement s.n.* (holo: PR 528303; iso: K 186467, 186468).

Herb to 20 cm high; stems usually prostrate, rarely ascending to erect. **Indumentum** sparsely to densely villose; hairs 0.1–0.9 mm long. **Leaves** oblong, suborbicular to obovate, 2.5–7 mm long, 2–4 mm wide, margin entire, adaxial and abaxial surfaces villose. **Involucres** mostly red; glands 0–0.25 mm long, 0.1–0.4 mm wide, red or yellow; gland appendages transverse-oblong, 0.1–0.3 mm long, 0.3–0.4 mm wide, shallowly to deeply toothed, red, yellow or white. **Capsules** 1.4–1.8 mm long, 1.4–1.8 mm wide; hairs 0.5–0.8 mm long. **Seeds** with faint to distinct irregular ridges on dorsal faces, 0.8–1.3 mm long, 0.5–0.6 mm tangentially, 0.5–0.6 mm radially. *n* = 11. **Fig. 25C.**

Additional selected specimens examined: **Western Australia.** just W of Wolf Creek Crater, Apr 1979, *George 15312* (PERTH); Meentheena Station Conservation Reserve, 12.7 km ESE of Bullgarina Hill, 7.3 km ESE of King Rock Hole, 30 km E of Mt Edgar, 25.8 km N of Baroona Hill, May 2000, *van Leeuwen 4497* (BRI, PERTH); 4 km SW of Two Sisters, *c.* 145 km SE of Shay Gap, Jul 1984, *Newbey 10481* (PERTH); Hamersley Range N.P., just S of Marandoo Ridge near entrance to 'Grimace Gulch', Sep 1978, *Trudgen 2253* (PERTH); Hamersley Range N.P., 0.3 km from Mindi Springs on track to Juna Downs, Mar[?] 1980, *Trudgen 2616* (PERTH); Rudall River, Aug 1971, *Wilson 10308* (PERTH); Rudall River, May 1971, *George 10641* (PERTH); Turee Creek, Turee Station, *c.* 40 km E of Paraburdoo, Sep 2006, *Halford Q9233A* (BRI); Jacobs Creek Gully, May 1995, *Cranfield 9701* (PERTH); 1 km NE of Thompsons Mill, Mt Gould Station, May 1986, *Cranfield 5434* (PERTH); *c.* 5 km NE of Wellington Range on road from Wiluna to Carnegie homestead, Sep 1984, *Wilson 11975* (PERTH). **Northern Territory.** Bunda Station, Jun 1994, *Egan 4215* (DNA); Wave Hill Station, Mar 1997, *Michell 634 & Mangion* (DNA); Supplejack Station, 38 km W of homestead, Sep 1970, *Henshall 2329* (DNA); Kings Canyon, 1.5 km W [of] George Gill Range, Jul 1981, *Thomson 74* (DNA).

Queensland. BURKE DISTRICT: 251.7 km S of Normanton, May 1976, *Hassall 7638* (BRI); 63.5 km by road S of Burke & Wills Roadhouse on Burke Development Road, Mar 2005, *McDonald KRM4131* (BRI); 12 km NE of Mt Isa, May 1983, *Schmid 673* (BRI); Cloncurry–Normanton road, 8.1 km N of Quamby, Jun 1999, *Bean 15172* (BRI); 20 km W of Cloncurry, on road to Mount Isa, Jun 1991, *Halford Q443* (BRI, MEL).

Distribution and habitat: *Euphorbia australis* var. *subtomentosa* is widespread in inland WA extending across the NT to western Qld (**Map 4e**). It grows in *Triodia* grassland, *Acacia*/eucalypt woodland communities on skeletal to shallow gravelly sand to clay soils on plains, alluvial flats or rocky hills.

Phenology: Flowers and fruits have been collected from January to October.

Notes: *Euphorbia australis* var. *subtomentosa* is similar to *E. australis* var. *erythrantha*. For features distinguishing of *E. australis* var. *subtomentosa* from *E. australis* var. *erythrantha*, refer to the 'Notes' section under that variety.

As circumscribed here *E. australis* var. *subtomentosa* has two distinct forms. Though the extremes of these variants are distinctive they do merge into one another with numerous intermediates in the Pilbara region where their distributions overlap. The two forms are as follows:

Typical form: Stems prostrate, usually red in colour, hairs on stems >0.4 mm long; leaves pale green often with red blush over surfaces or red tinge along margins; cyathia usually red rarely grey-green, seeds 1–1.3 mm long. This is common throughout the western part of the range for this variety (e.g. *Cranfield 5434*, *9701*, *Trudgen 2253*).

Eastern form: Stems ascending to erect or prostrate, grey-green rarely red in colour, hairs on stems mostly ≤0.4 mm long; leaves mostly grey-green in colour; cyathia mostly grey or grey-green rarely red, seeds 0.8–1 mm long. This is common in north-western Qld but extends to the Kimberley and the Pilbara region, WA (e.g. *Egan 4215*, *George 15312*, *Hassall 7638*).

5. *Euphorbia biconvexa* Domin, *Biblioth. Bot.* 89(4): 308 (1927 '1926'); *Chamaesyce biconvexa* (Domin) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** Queensland. [COOK DISTRICT:] apud opp. Mungana, in colle calcareo, February 1910, *K.Domin s.n.* (holo: PR 528286).

Illustration: Weber (1986: 749, fig. 401B), as *E. coghlanii*.

Monoecious, annual or herbaceous perennial with short-lived stems produced from thick cylindrical taproot, to 80 (100) cm high, few to many stems arising from rootstock. **Stems** ascending to erect (rarely prostrate), sparingly to much branched, smooth, glabrous or rarely sparsely pilose with \pm spreading white hairs 0.2–1 mm long. **Interpetiolar stipules** narrow-triangular, 0.6–1.5 mm long, bifid or deeply bipartite, glabrous; margin lacinate (rarely entire). **Leaves:** petiole 0.7–1 mm long, smooth, glabrous; blade oblong, narrow-ovate or ovate, sometimes falcate, 8–36 mm long, 2.5–9 mm wide, 2–6 times longer than wide; adaxial surface green to dark green or glaucous, sometimes with reddish tinge on margin, smooth, glabrous; abaxial surface paler than adaxial surface, smooth, glabrous or rarely sparsely pilose with spreading, crispate hairs to 1 mm long; base asymmetric with one side cordate, the other rounded to cordate; margin entire or serrulate distally; apex acute to obtuse or rounded. **Cyathia** solitary at the upper nodes, sometimes clustered on short leafy lateral branchlets with subtending leaves smaller than the primary stem leaves; peduncles 1–2 mm long. **Involucres** turbinate, 0.8–1 mm long, 0.9–1.1 mm across; lobes 5, triangular or subulate, 0.3–0.5 mm long, margin entire or lacinate; glands 4, stipitate, patelliform, planar or concave, transverse-oblong or orbicular in outline, 0.1–0.2 mm long, 0.1–0.4 mm wide, yellowish green; gland appendages conspicuous, spreading radially, broad-obovate or reniform, 0.2–0.4 mm long, 0.3–0.8 mm wide, white (rarely red), glabrous, margin entire; bracteoles 0.8–1 mm long, adnate for *c.* 1/3 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** 1–15 per cyathium; pedicels *c.* 0.9

mm long; staminal filaments 0.3–0.4 mm long. **Pistillate flowers:** styles 0.4–0.5 mm long, spreading to erect, recurved distally, smooth, glabrous, each bifid for *c.* 1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3 mm long, transversely broad-elliptic in lateral view, 1.6–2 mm long; 2–2.5 mm across, deeply 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** narrow-ovate or elliptic in outline, 1–1.5 mm long, 0.5–0.9 mm tangentially, 0.9–1.1 mm radially, laterally compressed, biconvex in transverse section; faces convex, smooth; exotesta thin, of even thickness over surface, pale grey, microreticulate, becoming mucilaginous when moistened; endotesta brown. *n* = 8. **Fig. 25D.**

Additional selected specimens examined: **Western Australia.** Djaluwon Creek, near S end of Lake Gregory, Apr 1979, *George 15384* (PERTH); Mt Windell road corridor, 8 km NW of Mt Windell, 3.6 km ESE of Karijini N.P. headquarters, Mar 1992, *van Leeuwen 1105* (PERTH); Hamersley Range N.P., *c.* 0.5 km S from Dales Gorge turnoff, on Yampire Gorge – Juna Downs homestead road, Aug 1977, *Jackson 2938* (AD, MEL); 25 miles [*c.* 40 km] S of Sir Frederick Range, Aug 1962, *Symon 2289* (AD); Wooramel River crossing, Innouendy Station, May 1995, *Cranfield 9733* (PERTH); 30 km S [of] Karratha, May 1991, *Thomson 3501* (DNA). **Northern Territory.** Cutta Cutta Caves Reserve, Feb 1989, *Thomson 3271* (DNA); 2 km S of Daly Waters on the Stuart Highway, Feb 1988, *Thomson 2235* (BRI); 22 km N [of] Ucharonidge homestead, Feb 1989, *Thomson 3247* (BRI); 5 km NW of Wycliffe Well, May 1983, *Halford 83536* (DNA); Palm Valley, Sep 1958, *Chippendale 4912* (AD, DNA, MEL); Uluru (Ayers Rock – Mt Olga) N.P., Kata Tjuta (the Olgas), Kata Tjuta Lookout walk, on the Docker River Road, 45 km WNW of Ranger Station, May 1988, *Lazarides & Palmer 63* (AD, DNA). **Queensland.** COOK DISTRICT: near Telecom Tower, Chillagoe, Mar 1990, *Forster PIF6529* (BRI). BURKE DISTRICT: Hughenden – Mt Isa Road, *c.* 104 km W of Julia Creek, Apr 1975, *Halliday 424* (BRI); Lookout and carpark area, Porcupine Gorge, 65 km N of Hughenden, Apr 1997, *Archer 340* (BRI); 27 km E of Cloncurry; beside the Flinders Highway, Feb 2001, *Wannan 2114 & Jago* (BRI). MITCHELL DISTRICT: Lochern N.P., N of Stonehenge, Mar 1998, *Forster PIF22371 & Booth* (BRI, MEL). GREGORY NORTH DISTRICT: Mayne River crossing on Winton to Jundah Road, Apr 1986, *Neldner 2525 & Stanley* (BRI). **South Australia.** 5 km SW end of Callyamurra Waterhole, Apr 1987, *Reid 685* (AD); minor branch of Red Mulga Creek, May 1987, *Symon 14447* (AD, HO, MEL).

Distribution and habitat: *Euphorbia biconvexa* is endemic to Australia and widespread across the northern part of the continent from Carnarvon, WA, through the northern and southern central areas of the NT and far northern SA to Clermont, in central Qld (**Map 5**). It grows in a wide range of grassland, or eucalypt/*Acacia* woodland communities on sandy to clay soils on plains, rocky hillsides or along drainage lines.

Phenology: Flowers and fruits have been collected throughout the year, particularly from February to September.

Notes: *Euphorbia biconvexa* is similar to *E. coghlanii* and *E. trigonosperma* in habit, general appearance and seed surface texture but differs in having seeds that are lenticulate in transverse section compared with suborbicular for *E. coghlanii* and trigonous for *E. trigonosperma*.

6. *Euphorbia bifida* Hook. & Arn., *Bot. Beechey Voy.* 213 (1837); *Chamaesyce bifida* (Hook. & Arn.) T.Kuros., *Acta Phytotax. Geobot.* 51(2): 212 (2001 ‘2000’). **Type:** China. “collected about the neighbourhood of Macao and the Islands adjacent”, 20 July – 30 August 1830, *Rev. G.H.Vachell* 240 (holo: E-GL *n.v.*; iso: K *n.v.* (cibachrome seen).

Euphorbia vachellii Hook. & Arn., *Bot. Beechey Voy.* 213 (1837); *Chamaesyce vachellii* (Hook. & Arn.) H.Hara, *Enum. Spermat. Jap.* 3: 44 (1954). **Type:** [China.] Macao, 17 July 1830, *G.H.Vachell* 241 (holo: E-GL *n.v.* (image seen); iso: K *n.v.*).

Euphorbia micradenia Boiss., in A.DC., *Prodr.* 15(2.2): 27 (1862); *E. macgillivrayi* var. *micradenia* (Boiss.) Domin, *Biblioth. Bot.* 89(4): 311 (1927 ‘1926’); *Chamaesyce micradenia* (Boiss.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. COOK DISTRICT:] Albany Island, August 1855, *F.Mueller s.n.* (holo: K 186475; iso: G-DC *n.v.* (microfiche IDC 800-73. 2419: II. 4), MEL 530408, P 698542 *n.v.* (image seen).

Euphorbia macgillivrayi Boiss., in A.DC., *Prodr.* 15(2.2): 26 (1862); *E. macgillivrayi* Boiss. var. *macgillivrayi*, Domin, *Biblioth. Bot.* 89(4): 865 (1927 ‘1926’); *Chamaesyce*

macgillivrayi (Boiss.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. SOUTH KENNEDY DISTRICT:] Port Molle, December 1847, *J.McG [J.MacGillivray] s.n.* (lecto [here designated]: K 186474).

Euphorbia mitchelliana var. *stenophylla* Benth., *Fl. Austral.* 6: 47 (1873). **Type:** [Northern Territory.] Port Darwin, 7 December 1871, [*M. Schultz* 854; (lecto [here designated]: K 186483).

Euphorbia macgillivrayi var. *yarrabensis* Domin, *Biblioth. Bot.* 89(4): 311 (1927 ‘1926’). **Type:** Queensland. [COOK DISTRICT:] In xerodrymio apud opp. Yarraba, January 1910, *K.Domin s.n.* (lecto [here designated]: PR 528309).

Euphorbia macgillivrayi var. *pseudoserrulata* Domin, *Biblioth. Bot.* 89(4): 311 (1927 ‘1926’). **Type:** Queensland. [COOK DISTRICT:] apud opp. Chillagoe, February 1910, *K.Domin s.n.* (lecto [here designated]: PR 528314).

Euphorbia macgillivrayi f. *glabrata* Domin, *Biblioth. Bot.* 89(4): 311 (1927 ‘1926’). **Type:** Queensland. [MORETON DISTRICT:] prope Brisbane River, 1863–1865, *A.Dietrich* 406 (lecto [here designated]: PR 528316).

Euphorbia serrulata Reinw. ex Blume, *Bijdr. Fl. Neerl. Ind.* 635 (1826 ‘1825’), non Thuill. **Type:** Timor. *s.d.*, [C.G.C.] *Reinwardt s.n.* (Herb. Lugd. Bat. No. 903.159–328) (holo: L *n.v.* [photo at BRI]).

Illustrations: Brock (1988: 183), as *Euphorbia vachellii*; Wheeler (1992: figs 184P, 185P, 186P (1992), as *E. vachellii*.

Monoecious, annual or herbaceous perennial with short-lived stems produced from thick cylindrical taproot, to 80 cm high, one to few stems arising from rootstock. **Stems** erect to ascending, sparingly branched, smooth, glabrous or densely puberulous on young stems becoming sparser with age; hairs weakly appressed to spreading, crispate, 0.1–0.5 mm long, white. **Interpetiolar stipules** subulate, 0.8–2 mm long, deeply bipartite, glabrous; margin laciniate. **Leaves:** petiole 1–3 mm long, smooth, glabrous or with indumentum as for stems; blade linear to oblong, lanceolate to narrow-ovate or narrow-elliptic, 20–80

mm long, 2–12 mm wide, 2.6–20 times longer than wide; adaxial surface green sometimes with reddish tinge on margin, smooth, glabrous or sparsely pubescent with weakly appressed to ascending, crispate hairs 0.3–0.6 mm long; abaxial surface pale green, smooth, glabrous or with indumentum as for adaxial surface; base mostly asymmetric with one side cordate or obtuse, the other cuneate to rounded or slightly cordate; margin serrate sometimes only distally (rarely entire); apex acute to obtuse. **Cyathia** grouped together in congested 2–7 branched dichasial cymes together with a solitary cyathium at the distal nodes; peduncles 3–15 mm long; bracts subulate to narrowly triangular or leaf-like but much smaller than the primary stem leaves; cyathial peduncles 1–4(6) mm long. **Involucres** turbinate, 0.7–1.4 mm long, 1–1.3 mm across; lobes 5, triangular, 0.4–0.7 mm long, margin entire or lacinate; glands 4, stipitate, patelliform or cupuliform, planar or with distinct central pit, transverse-oblong to transverse-elliptic or orbicular in outline, 0.1–0.3 mm long, 0.2–0.4 mm wide, red or yellowish green; gland appendages conspicuous (rarely inconspicuous), spreading radially, broad-obovate to obdeltoid or oblong, 0.3–2.2 mm long, 0.3–2 mm wide, white, glabrous, margin entire; bracteoles 0.8–1.7 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into few to numerous subulate glabrous or hirsute segments. **Staminate flowers** 3–30 per cyathium; pedicels 1.2–1.6 mm long; staminal filaments 0.2–0.3 mm long. **Pistillate flowers**: styles 0.3–0.8 mm long, sometimes connate at the base into a column for *c.* 1/7 of their length, spreading, smooth, glabrous, each bifid for 1/3–2/3 of their length, the apices stout terete. **Capsules** exserted from involucre on pedicel to 3 mm long, very broad-ovate or broad-elliptic in lateral view, 1.7–2.1 mm long, 1.9–2.5 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous or with a sparse indumentum consisting of \pm appressed hairs 0.2–0.3 mm long; hypogynous disc entire. **Seeds** broad-ovate in outline, 1.1–1.5 mm long, 0.8–1.1 mm tangentially, 0.8–1 mm radially, tetragonous or trigonal in cross section; dorsal and ventral faces convex,

with 3–6 distinct narrow rounded transverse ridges; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta red brown to dark brown. *n* = 8. **Fig. 25E.**

Additional selected specimens examined: **Western Australia.** ‘Duncan’s Swamp’, WSW of Amax Campsite, Mitchell Plateau, May 1978, *Kenneally 6775* (PERTH); ‘Rocky Creek’, 27.3 km NW of Doongan Station on Gibb River – Kalumburu Road, Jun 1987, *Edinger 291* (PERTH); adjacent to Rocky Creek, 27.3 km NW of Doongan Station, Jun 1987, *Koch 544* (PERTH); Calder River crossing, 80 km NNW of Beverley Springs, Jan 1993, *Barrett MDB139* (PERTH). **Northern Territory.** Finniss River Station, Aug 1997, *Cowie 7644 & Mangion* (DNA); East Alligator floodplain, Jun 1992, *Cowie 3031* (DNA); mouth of Daly River, near Palmerston Island, Feb 1994, *Leach 4006* (DNA); 41 miles [*c.* 66 km] E [of] Pine Creek, Apr 1962, *Nelson 301* (AD, BRI, DNA, MEL); Kakadu N.P., Gwalmek, Jan 1995, *Russell-Smith 9182* (DNA); South Bay, Bickerton Island, Jun 1948, *Specht 533* (AD, BRI, MEL); west side of Cape Shield, May 1993, *Cowie 4069 & Leach* (DNA); Maria Island, Jul 1972, *Dunlop 2837* (DNA). **Queensland.** COOK DISTRICT: 1 km E of junction of Piccaninny and Scrubby Creek, Archer Bend N.P., Jun 1993, *Neldner 4102* (BRI). NORTH KENNEDY DISTRICT: 4.8 km S of Inkerman, Bruce Highway, Sep 1976, *Williams 76079* (BRI); 6 km N of Elliot River, 67 km SE of Home Hill, Apr 1975, *McDonald 1371 & Batianoff* (BRI); Nelly Bay, near Dingo Beach, north of Proserpine, Apr 2002, *Bean 18676* (BRI). SOUTH KENNEDY DISTRICT: Hay Point, Nov 1978, *Stanley 78304* (BRI). LEICHHARDT DISTRICT: Sutton Development Road, ‘Wedelia’, *c.* 1 km W of Kemmis Creek turnoff, Feb 1994, *Champion 1019 & Dixon* (BRI). BURNETT DISTRICT: Branch Creek road, 9.5 km NNW of Binjour, Feb 2005, *Bean 23475* (BRI). MORETON DISTRICT: Opossum Creek, Springfield, Ipswich, Jan 1996, *Bird s.n.* (BRI [AQ487777]). **New South Wales.** Roseberry, Apr 1947, *Jones 4* (BRI [AQ202910]).

Distribution and habitat: *Euphorbia bifida* occurs from South East Asia to Australia. In Australia it is widespread across coastal and subcoastal parts of northern Australia from Derby, WA, to Cairns, Qld and south along the east coast to Rosebery (near Kyogle) in northern NSW (**Map 6**). It grows in a wide variety of habitats; grassland, Melaleuca/eucalypt woodland or open forest communities; on rocky seashores, coastal dunes, swamps, alluvial plains or rocky hillsides. The soils vary from sands to cracking clays.

Phenology: Flowers and fruits have been collected throughout the year.

Typification: Boissier (1862) cited two collections in his protologue of *E. macgillivrayi* namely “Ad Port Molle Australiae (M’Gillivray!), Gould Island (Id. forma major!) ... (v.s. in herb. Kew!)”. Two collections, which are considered as syntypes of the name *E. macgillivrayi*, have been located amongst material of *Euphorbia* on loan to BRI from K [**a**: Voyage of Rattlesnake, Bot. 192, Port Molle, Dec 1847, JMcG. (K) [K 186474]; **b**: Voyage of Rattlesnake, Bot 258, Gould Island, May 22nd 1848, John MacGillivray [K 186473]]. The collection from Port Molle [K 186474] is here selected as lectotype because it is part of the original material, is the more ample and better preserved and has morphology that matches the description in the protologue of this species. Both syntypes are referable to *E. bifida* as applied here.

Bentham (1873) cited four collections made by M.Schultz from Port Darwin in his protologue of *E. mitchelliana* var. *stenophylla* namely “Port Darwin, Schultz, n. 38, 505, 549 and 854”. The four collections **a**: Port Darwin, North Australia, *s.d.*, [Schultz] 38, from R. Schomburgk Oct 1869 (K 186481); **b**: Port Darwin, N. Australia, 3/70, F. Schultz 549 comm. R. Schomburgk (K 186482); **c**: Port Darwin, 7/12/71, Schultz 854 (K 186483); **d**: Port Darwin, N. Australia, 3 1870, Schultz 505 comm. R. Schomburgk (K186484), have been located amongst material of *Euphorbia* on loan to BRI from K. B.G. Thomson annotated the collection Schultz 854 (K 186483) as lectotype in 1989. However, his choice has not been published. We agree with his choice and the collection Schultz 854 (K 186483) is here selected as lectotype because it is part of the original material, is the more ample and complete of the four collections and has morphology that best matches the description in the protologue of this variety. The syntypes Schultz 38 and 549 are referable to *E. bifida*, while Schultz 505 is referable to *E. mitchelliana* var. *mitchelliana* as applied here.

Domin (1827) cited four of his collections from northern Queensland in his protologue of *E. macgillivrayi* var. *pseudoserrulata* namely “Queensland: bei Chillagoe sehr

typisch (DOMIN II. 1910); Savannenwälder bei Pentland (DOMIN III. 1910); ...Picnic Hill in der Nähe der Russell-Mündung (DOMIN I. 1910); ...Beech Mts. (DOMIN III. 1910)”. Five sheets [PR 528311, 528312, 528313, 528314, 528315] which are considered as syntypes of the name *E. macgillivrayi* var. *pseudoserrulata*, have been located amongst material of *Euphorbia* on loan to BRI from PR. The collection from Chillagoe [PR 528314] is here selected as lectotype because it is part of the original material, is the more ample and, as Domin comments in the protologue, this collection is very typical of this variety. In 1989, B.G.Thomson annotated the collection from Pentland, *Domin* [PR 528312] as lectotype but this was not published. All of the syntypes [PR 528311, 528312, 528313, 528314, 528315] are referable to *E. bifida* as applied here.

Domin (1827) in his protologue of *E. macgillivrayi* var. *yarrabensis* states “Nordost-Queensland: Savannenwälder in der Ebene bei Yarraba (DOMIN I. 1910)”. Three collections (PR 528308, 528309, 528310) which are considered by us as syntypes of the name *E. macgillivrayi* var. *yarrabensis*, have been located amongst material of *Euphorbia* on loan to BRI from PR. The collection (PR 528309) is here selected as lectotype because it is part of the original material, is the more ample and complete of the three collections and has morphology that best matches the description in the protologue of this variety. In 1989, B.G.Thomson annotated the collection *Domin* [PR 528310] as lectotype but this was not published. All of the syntypes [PR 528308, 528309, 528310] are referable to *E. bifida* as applied here.

Domin (1927) cited two collections in his protologue of *E. macgillivrayi* forma *glabrata* namely “sind z. B. die von A. Dietrich sub no. 406 und 1031”. Two collections, which are considered as syntypes of the name *E. macgillivrayi* forma *glabrata*, have been located amongst material of *Euphorbia* on loan to BRI from PR [**a**: Queensland. “prope Brisbane River, 1863-1865, A. Dietrich 406” (PR 528316); **b**: Queensland. “prope Brisbane River, 1863-1865, A. Dietrich 1031” (PR

528317). The collection *Dietrich 406* (PR 528316) is here selected as lectotype because it is part of the original material, the more ample and better preserved of the syntypes of this forma. Both syntypes are referable to *E. bifida* as applied here.

Notes: *Euphorbia bifida* is similar to *E. mitchelliana* in seed shape and seed surface ornamentation but differs from that in having its cyathia grouped together in congested 2–7 branched dichasial cymes together with a solitary cyathium at the distal nodes.

As circumscribed here, *Euphorbia bifida* is morphologically variable. There is considerable variation in the general habit, indumentum, and leaf dimensions and shape. Although the extreme forms within this species differ considerably from each other, much of the morphological variation appears to intergrade, making it difficult in assigning some material to one or other form. For this reason we have not formally recognised these variants. A more detailed analysis of Australian populations might lead to the recognition of infraspecific taxa, but a study of the species across its entire range would be desirable to place this variation in context. The more notable variants observed in Australia are:

Annual form: fibrous rootstock, stems erect and little branched, leaves linear to lanceolate 5–23 times as long as wide, margins conspicuously serrate. (e.g. *Leach 4006*, *Kenneally 6775*, *Cowie 1235*). This is widespread and the most commonly collected form and is recorded from Kimberley, WA across the NT to Qld.

Perennial form: perennial rootstock with erect annual stems, leaves narrow-ovate to narrow-oblong, 3–8 times as long as wide, margins not conspicuously serrate (*Dunlop 5593*, *Nelson 301*, *Short 5025*). This occurs in the NT and Qld.

Coastal form often on frontal dunes: perennial rootstock, stems mostly prostrate, leaves narrow-oblong to oblong or narrow-elliptic to elliptic 18–25 mm long, 2–3 times as long as wide. (e.g. *Bean 18676*, *McDonald 1371* & *Batianoff*, *Stanley 78304*). It is commonly

recorded along the east coast from Cape York south to Fraser Island. The following names placed in synonymy are applicable to this variant: *E. macgillivrayi* and *E. micradenia*.

7. *Euphorbia careyi* F.Muell., *Fragm.* 11: 64 (1881). **Type:** Western Australia. Fortescue River, in 1878, *H.S.Carey s.n.* (holo: MEL 61116).

Euphorbia bouleyi S.Moore, *J. Linn. Soc., Bot.* 45: 212 (1920). **Type:** [Western Australia.] NW Coast, *s.d.*, *de Bouley s.n.* (holo: BM 812174).

Diocious (rarely monoecious), herbaceous perennial, 15–80 cm high, often with compact fan-like habit, single or few stems arising from roostock. **Stems** ascending or erect (rarely prostrate, *Royce 7141*, 7077 [PERTH]), much branched, smooth, with a sparse to moderately dense indumentum; hairs appressed to ascending, curved to crispate or sometimes straight, to 0.1 (0.2) mm long, white. **Interpetiolar stipules** narrow-triangular, 0.2–0.5 mm long, deeply bipartite, pubescent; margin laciniate. **Leaves:** petiole 0.2–0.6 mm long, smooth, with indumentum as for stems; blade oblong, obovate or oblong-elliptic, 2–9 mm long, 1.5–5 mm wide, 1.2–1.8 times longer than wide; adaxial surface yellow-green or light to dark green, smooth, with a sparse to moderately dense indumentum (rarely glabrous, *Harris WKH2224* [BRI]); hairs spreading, curved to crispate, to 0.1 mm long; abaxial surface paler than adaxial surface, smooth, with indumentum as for adaxial surface; base asymmetric with one side rounded to cordate, the other cuneate; margin serrulate to serrate or entire; apex rounded to obtuse. **Cyathia** solitary at the upper nodes; peduncles 0.4–1 mm long. **Involucres** turbinate to cupuliform, 0.5–1.1 mm long, 0.8–1.3 mm across; lobes 5, oblong or triangular, 0.4–0.5 mm long, margin laciniate; glands 4, subsessile, patelliform, planar or shallowly concave, transverse-oblong to transverse-elliptic in outline, 0.3–0.5 mm long, 0.4–0.8 mm wide, yellow; appendages conspicuous to inconspicuous or absent, spreading radially; transverse-oblong, 0.2–0.3 mm long, 0.5–0.9 mm wide, yellow (rarely red), glabrous, margin dentate or

shallowly lobed; bracteoles 0.5–1.3 mm long, adnate for 1/2–2/3 of their length to involucre, free portion divided into numerous subulate glabrous or hirsute segments. **Staminate flowers** 6–25 per cyathium; pedicels 1–1.4 mm long; staminal filaments 0.3–0.4 mm long. **Pistillate flowers**: styles 0.5–0.8 mm long, connate at the base into a column for 1/5–1/7 of their length, spreading with recurved apices, smooth, glabrous or with a few minute erect hairs proximally, each bifid for 1/2–2/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 3 mm long, broad-elliptic or broad to very broad-ovate in lateral view, 1.4–1.6 mm long, 1.6–1.9 mm across, shallowly 3-lobate with keels acute, papillose, densely hairy; hairs evenly distributed over capsule, spreading or appressed-ascending, to 0.1 mm long; hypogynous disc entire or lacinate. **Seeds** broad-ovate in outline, 0.9–1.2 mm long, 0.7–0.8 mm tangentially, 0.7–0.8 mm radially, tetraquetrous in cross section; dorsal faces \pm planar; ventral faces planar or slightly concave; all faces with low faint irregular ridges; exotesta thin, of even thickness, white to pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red brown or pale brown. **Fig. 25F**.

Additional selected specimens examined: **Western Australia.** Karratha, Jul 1981, *Craig 240* (PERTH); Enderby Island, Jun 1980, *Onus 72* (PERTH); Depuch Island, May 1962, *Royce 7077* (PERTH); floodplain of Robe River, c. 8 km SE of Pannawonica, Sep 2003, *Maier & McCreery 511* (BRI); c. 50 km S of Dampier on Hamersley Iron Railway line road, Apr 1995, *Mitchell PRP225* (PERTH); c. 3 km E of Deepdale Outcamp where the Robe River crosses the Deepdale to Millstream Road, Nov 1996, *Mitchell PRP1492* (BRI); Hamersley Ranges, valley of Bungaroo Creek, 15.4 km SE of Yathala (Old Yalleen) Well, Apr 1995, *Trudgen MET12311 et al.* (PERTH); Tambrey Station, Sep 1969, *Brooker 2122* (PERTH); Tombourah Creek, Marble Bar, Aug 1989, *De Jong s.n.* (PERTH 4026241); Meentheena Conservation Reserve, 6.5 km SSE of Meentheena Station homestead, May 2001, *van Leeuwen 4804* (PERTH); Carawine Gorge, Sep 1991, *Wilson & Rowe 913* (NSW); 2.5 km SW of Silver Grass Peak, 30 km NNE of Mt Farquhar, Jul 1999, *Backhouse BEM22 et al.* (PERTH); 32.2 miles [c. 51.8 km] from Roebourne turnoff on Tom Price to Wittenoom Road, Aug 1971, *Ashby 4182* (AD, PERTH); Chichester Range, c. 200 km (215 km by road) S of Port Hedland, along the road to the Hamersley Range, Apr 1977, *Eichler 22546* (PERTH); Barlee Range N.R., 3.2 km S of Wongida Well, 12.5 km SW of Mt Florry, 11.6 km E of Minnie Spring, Barlee Range,

Aug 1993, *van Leeuwen 1502* (PERTH); Barlee Range, Henry River, Aug 1961, *Royce 6535* (PERTH); 5 km W of Ashburton Downs homestead, Jul 1977, *Mitchell 424* (PERTH); Newman, Jul 1981, *Deighton 110* (PERTH).

Distribution and habitat: *Euphorbia careyi* is confined to the Pilbara, north-western WA, occurring from the Dampier Archipelago, south to Barlee Range and east to Carawine Gorge on the Oakover River (**Map 7**). It grows in hummock grassland, shrubland or low woodland communities on shallow stony, sandy to clay loam soils, on mostly rocky scree slopes or stony hillsides.

Phenology: Flowers and fruits have been collected from February to November (with most collections made from June to September).

Notes: *Euphorbia careyi* can be confused with *E. australis* but is distinguished by its more or less fan-like habit, generally shorter indumentum, larger involucre glands, generally green or yellow-green leaves and dioecy.

The typical form of this species has an indumentum of short, appressed to ascending crispate to curved hairs. A less common variant occurring in the southern half of the species range has an indumentum of short, spreading, \pm straight hairs (e.g. *Ashby 4182*, *Deighton 110*).

The following collections are tentatively placed here. Although their general leaf shape, indumentum and involucre glands are consistent with *Euphorbia careyi*, they differ in having shorter styles, darker green leaves with a reddish tinge along margins and coarser toothed leaf margins (Robe River, between Onslow and Roebourne, Aug 1966, *Butler 37* (PERTH); Burrup Peninsula, near Karratha, Aug 2004, *Harris WKH2206* (BRI); on track up Table Top Hill, Karratha, Aug 2004, *Harris WKH2203* (BRI); ‘Grimace Gulch’, through Maraddoo Ridge, Hamersley Range N.P., Sep 1978, *Trudgen 2296* (PERTH); Dolphin Island, Dampier Archipelago, May 2000, *Trudgen 23472* (BRI); ESE of Whim Creek, 7.3 km and 1.3 km S of North West Coastal highway, Jun 2000, *Trudgen 23473* (BRI); Burrup Peninsula, 1.4 km almost due S of Holden Point between Dampier Port and

North West Shelf Gas plant, Jun 2000, *Long MET & A026* (BRI).

8. *Euphorbia carissoides* F.M.Bailey, *Queensland Agric. J.* 16: 449 (1906); *Chamaesyce carissoides* (F.M.Bailey) P.I.Forst. & R.J.F.Hend., *Novon* 5: 323 (1995). **Type:** Queensland. [COOK DISTRICT:] Herberton, [March 1906,] *R.C.Ringrose s.n.* (holo: BRI [AQ342536]; iso: K).

Euphorbia schizolepis var. *glabra* Benth., *Fl. Austral.* 6: 47 (1873). **Type:** [Queensland. COOK DISTRICT:] Gulf of Carpentaria, *s.d.*, *DM [F.Mueller] s.n.* (holo: K 186491; iso: G-DC *n.v.* [IDC microfiche 800-73. 2416: I. 4], MEL 6122).

Illustration: Forster (1993: 271, fig. 1).

Monoecious, herbaceous woody perennial with few stems arising from woody taproot, 25–120 cm high, the whole plant glabrous. **Stems** ascending to erect; sparingly to much branched, smooth, often with grey-white bloom. **Interpetiolar stipules** subulate, 0.1–2 mm long, entire or deeply bipartite, glabrous; margin entire or lacinate. **Leaves:** petiole 1–2.5 mm long, smooth; blade ovate, 5–36 mm long, 3.5–19 mm wide, 1.4–2 times longer than wide; adaxial and abaxial surfaces grey–green or blue green often with red to pink tinge and whitish bloom, smooth; base symmetric, cordate; margin serrate; apex acute or obtuse, sometimes apiculate. **Cyathia** solitary at the nodes; peduncles 1.5–6.5 mm long. **Involucres** turbinate, 2–2.5 mm long, 1.5–2.5 mm across; lobes 5, triangular, 0.5–1 mm long, margin entire; glands 4, shortly stipitate, patelliform, planar or shallowly concave, transverse-oblong to reniform in outline, 0.7–0.8 mm long, 1.3–1.8 mm wide, mostly red; gland appendages conspicuous, spreading radially, transversely oblong, 0.7–1.4 mm long, 2–2.5 mm wide, white turning pink to red with age, glabrous, margin irregularly dentate; bracteoles 2–2.5 mm long, divided into 2–5 \pm linear plumose segments. **Staminate flowers** 15–20 per cyathium; pedicels 1.5–2.5 mm long; staminal filaments 0.7–0.8 mm long. **Pistillate flowers:** styles 1.5–2.3 mm long, connate at the base into a column for *c.* 1/3 of their length,

erect, spreading distally, smooth, glabrous, entire, the apices terete. **Capsules** exerted from involucre on pedicel to 5 mm long, depressed ovate or transversely broad-elliptic in lateral view, 3.5–4 mm long, 4–5 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate to broad-ovate in outline, 1.9–2.4 mm long, 1.5–1.9 mm tangentially, 1.6–1.9 mm radially, tetragonous in cross-section; dorsal faces planar or slightly convex; ventral faces planar or slightly concave; all faces \pm smooth; exotesta of even thickness, *c.* 0.1 mm thick, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta brown or red-brown. **Fig. 25G.**

Additional selected specimens examined: Queensland. COOK DISTRICT: Bridge Creek Pastoral Holding, Nov 2000, *Stanton 305* (BRI); Blue Hills, Mt Surprise Gemfields, Jul 1987, *Champion 253* (BRI); Blue Hills, 49 km from Mt Surprise township, Mar 1988, *Champion 342* (BRI); O'Briens Creek fossicking area, *c.* 33 km NW (in straight line) of township of Mt Surprise, Sep 2000, *Champion 1673* (BRI); Crystal Creek, Jul 1996, *Ford 1752* (BRI); Pannikin Springs area, 29 km W of Mungana, Jan 1993, *Forster PIF12998 & Bean* (BRI); Pannikin Springs area, Blackdown Station, May 1999, *Forster PIF24369 & Booth* (BRI, MEL); *loc. cit.*, May 2000, *Forster PIF24405 & Booth* (BRI, MEL); Aroonbeta Holding, Walsh River Gorge, near mouth of St Helena Creek, Jan 1989, *Godwin C3159* (BRI); 13.5 km S along Lappa to Mt Garnet Road, Apr 2005, *Forster PIF30791 & McDonald* (BRI); 28.8 km S along Lappa to Mt Garnet Road, Apr 2005, *Forster PIF30805 & McDonald* (BRI); Stannary Hills, Aug 1908, *Bancroft 207* (BRI); Newcastle Range, 24 km E of Georgetown, Aug 1997, *Bean 12235* (BRI, MEL); 40 km N of Georgetown, May 1977, *Rice 2443* (BRI); O'Briens Creek gemfields via Mt Surprise, Jul 1994, *Coveny 16760 et al.* (BRI).

Distribution and habitat: *Euphorbia carissoides* is restricted to north-eastern Qld, occurring from near Georgetown and east to Stannary Hills, with a disjunct occurrence near Hopevale (**Map 8**). It grows on cliffines, rocky outcrops or hillsides in shrubland or eucalypt low open woodland communities on generally shallow soils derived from sandstone, granite or rhyolite substrates.

Phenology: Flowers and fruits have been collected in January, March to May, July to September and November.

Notes: *Euphorbia carissoides* does not appear to have any close relatives in Australia and is easily distinguished from other Australian

species of *Euphorbia* by the following combination of characteristics: glabrous, upright woody subshrub; smooth and glabrous capsules; styles entire; seeds tetraquetrous in transverse section with a smooth seed coat.

The species is reported to probably be fire intolerant and only persists in areas not regularly burnt (Forster 1993).

9. *Euphorbia centralis* B.G.Thomson, *Nuytsia* 8: 353, fig. 2 (1992); *Chamaesyce centralis* (B.G.Thomson) P.I.Forst. & R.J.F.Hend., *Novon* 5: 323 (1995). **Type:** Northern Territory. 3 km SW of Alice Springs, 18 January 1990, *B.G.Thomson 3408* (holo: DNA *n.v.*; iso: AD *n.v.*, BRI, CANB *n.v.*, *fide* Thomson [1992: 353]).

Illustration: Thomson (1992: 355, fig. 2).

Monoecious (rarely dioecious), annual or herbaceous perennial with short-lived stems produced from slender woody taproot, to 30 cm high, few to many stems arising from rootstock. **Stems** erect or occasionally decumbent, much branched, smooth, moderately dense to densely hispidulous, pubescent or pilose; hairs spreading or weakly ascending, straight or crispate, 0.1–1.1 mm long, white. **Interpetiolar** stipules narrow-triangular, 0.2–0.5 mm long, deeply bipartite, indumentum as for stems; margin lacerate. **Leaves:** petiole 0.5–1.3 mm long, smooth, with indumentum as for stems; blade elliptic to broad-elliptic, rotund or obovate, 3–7 mm long, 2–5 mm wide, 1.1–2 times longer than wide; adaxial and abaxial surfaces dark green to grey green (often with reddish tinge especially on margin), smooth, with a sparse to moderately dense indumentum; hairs spreading, \pm straight, 0.4–0.6 mm long; base asymmetric, one side rounded to cordate, the other cuneate to obtuse; margin coarsely serrate or sparsely minutely toothed; apex rounded. **Cyathia** solitary at the nodes; peduncles 0.2–1 mm long. **Involucres** turbinate, 0.8–1 mm long, 1–1.1 mm across; lobes 5, triangular, 0.3–0.5 mm long, margin entire or lacinate; glands 4, stipitate, patelliform, shallowly concave, transverse-oblong to transverse-elliptic in outline, 0.1–0.3 mm long, 0.4–0.6 mm wide, cream; gland

appendages conspicuous, spreading radially, broad-obovate, 0.4–1.3 mm long, 0.7–1.3 mm wide, pink to red, pale green or cream, glabrous, margin deeply lacinate; bracteoles 0.9–1 mm long, adnate for 1/3 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** 15–20 per cyathium; pedicels *c.* 1.1 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, connate at the base into a column for *c.* 1/10 of their length, ascending, recurved distally, smooth, glabrous, each scarcely bifid or divided *c.* 1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3.5 mm long, elliptic or rarely broad to very broad-ovate in lateral view, 1.5–2 mm long, 1.5–2 mm across, shallowly 3-lobate with keels acute, smooth or minutely papillose, sparsely to densely hairy; hairs mostly evenly distributed over capsule rarely confined to keels, spreading, 0.1–1 mm long; hypogynous disc entire. **Seeds** ovate in outline, 1.3–1.6 mm long, 0.7–0.8 mm tangentially, 0.7–0.9 mm radially, tetraquetrous in cross section; dorsal faces flat to concave; ventral faces concave; all faces with low faint to distinct irregular ridges; exotesta thin, of even thickness, white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown. *n* = 11. **Fig. 25H.**

Additional selected specimens examined: **Western Australia.** Pass of the Abencerrages, Rawlinson Range, Jul 1963, *George 4888* (PERTH); near N base of Mt Aloysius, Jul 1963, *George 5229* (PERTH); near Mt Squires, Barrow Range, Aug 1891, *Helms s.n.* (AD 96832153, MEL 2178635). **Northern Territory.** 66.3 km E of Stuart Highway towards 'Epenarra', May 2005, *Bean 23798* (BRI); 22 miles [*c.* 35 km] SSW of Georgina Downs Station, Mar 1953, *Perry 3471* (BRI, DNA); 20 miles [*c.* 32 km] NNE [of] Huckitta homestead, Jul 1970, *Latz 670* (AD, DNA, MEL); 1 km SW Muranji Rockhole, Mt Winter, Oct 1986, *Thomson 1552* (AD, DNA); Chewings Range, N face of range across from Giles Yard Spring, Feb 1990, *Thomson 3434* (DNA); Harts Range, E-end, Plot 1216, May 1988, *Thomson 2413* (DNA, MEL); Penny Springs, Kings Canyon, Jul 1985, *Leach 680* (DNA); 12.5 km N [of] Tempe Downs homestead, Aug 1988, *Barritt 324* (DNA, MEL); Atherrita Bore, 52 miles [*c.* 84 km] SE [of] Todd River homestead, Aug 1964, *Nelson 1303* (AD, BRI, DNA, NSW); Mann Range, 30 miles [*c.* 48 km] NE [of] Mt Davies Camp, Oct 1970, *Latz 908* (AD, DNA); 35 km E [of] Horseshoe Bend homestead, Nov 1993, *Albrecht 5571* (AD, DNA, MEL). **Queensland.** GREGORY NORTH DISTRICT: 21 km

WNW of 'Marion Downs', Sep 1978, *Purdie 1336* (BRI); Glenormiston, Toko Range, c. 1.8 km S of S-bend Gorge, Mulligan River on track to Cravens Peak homestead, Jun 2010, *Halford Q9867 & Forster* (BRI). **South Australia.** between Deering Hills and Mann Ranges, c. 18 km NE of Mt Cooperinna, Sep 1978, *Barker 3437* (AD, NSW); at foot of Mt Harriet, Sep 1963, *Whibley 947* (AD); 7 km E of Marys Well, De Rose Hill Station, Aug 1992, *Badman 6108* (AD); Beresford Hill, Oct 1978, *Chorney 992* (AD, NSW); 2 km SW of Bulgunnia Station homestead, Nov 1992, *Badman 6572* (AD).

Distribution and habitat: *Euphorbia centralis* occurs in central Australia from Tennant Creek, NT, south to Bulgunnia Station (S of Coober Pedy), SA and from Cavanagh and Barrow Ranges, WA east to Boulia, western Qld with a disjunct occurrence near Quilpie, south-western Qld (**Map 9**). It grows mostly in hummock grassland or *Acacia* shrubland communities on rocky scree slopes or stony hillsides. The soils are sandy, and often shallow and rocky, derived from granite, sandstone or limestone substrates.

Phenology: Flowers and fruits have been collected throughout the year, particularly from March to October.

Notes: *Euphorbia centralis* is similar to *E. australis* and can be difficult to distinguish from *E. australis* var. *erythrantha* in northern SA where these taxa distributions overlap. Mature plants of *Euphorbia centralis* exhibit a rounded shrub-like habit and have gland appendages 0.4–1.3 mm long that are deeply lacinate (versus 0.1–0.2(0.4) mm long and shallowly to deeply toothed for *E. australis* var. *erythrantha*).

10. *Euphorbia cinerea* W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 3: 161 (1918). **Type:** Western Australia. Devil's Pass [Windjana Gorge], Napier Range, May 1905, *W.V.Fitzgerald 591* (holo: PERTH).

Monoecious, herbaceous perennial with many short-lived stems produced from slender taproot, the whole plant glabrous. **Stems** prostrate, sparingly branched, longitudinally ridged. **Interpetiolar stipules** subulate, 0.6–0.8 mm long, deeply bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.2–0.7 mm long, smooth; blade oblong or obovate, 4–8 mm long, 2.6–5 mm wide, 1.6–2 times longer than wide, smooth, pale green; base

asymmetric with one side cordate, the other obtuse; margin sparsely minutely toothed distally; apex rounded to retuse. **Cyathia** solitary at nodes, often clustered on short leafy lateral branchlets; peduncles 0.1–0.2 mm long. **Involucres** campanulate or turbinate, 0.8–1 mm long, 0.6–0.8 mm across; lobes 5, triangular, 0.2–0.5 mm long, margin entire or serrulate; glands 4, stipitate, cupuliform, with distinct central pit, transverse-oblong or transverse-elliptic in outline, c. 0.1 mm long, 0.2–0.4 mm wide, pink; gland appendages conspicuous, spreading radially, reniform, 0.1–0.3 mm long, 0.4–0.8 mm wide, pink to white, glabrous, margin entire or shallowly lobed; bracteoles 0.6–0.8 mm long, entire or divided into few subulate glabrous segments. **Staminate flowers** 1–5 per cyathium; pedicels 0.9–1.1 mm long; staminal filaments 0.1–0.3 mm long. **Pistillate flowers:** styles 0.3–0.4 mm long, spreading, smooth, glabrous, entire, the apices terete. **Capsules** exserted from involucre on pedicel to 1.5 mm long, broad to very broad-ovate in lateral view, 1.1–1.3 mm long, 1.3–1.5 mm across, shallowly 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 0.7–0.8 mm long, 0.4–0.5 mm tangentially, 0.4–0.5 mm radially, tetraquetrous in cross section; dorsal faces slightly concave; ventral faces concave; all surfaces smooth or with 1 or 2 low faint ridges; exotesta thin, of even thickness, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown or red-brown. **Fig. 251.**

Additional selected specimens examined: **Western Australia.** upper reaches of Barker River, 2 km N of Mt Hart homestead, Jun 1987, *Edinger 421* (PERTH); Black Stone Mine, Leopold Range, May 1988, *Cranfield 6728* (PERTH); 3 km S of Karriwell Bore, 100 km E of Derby, Jun 1988, *Wilson 12788* (PERTH); Windjana Gorge N.P., Aug 1982, *Conrick 1083* (AD); Camballin Road, 14.7 km S of junction with Derby – Fitzroy Crossing Road, Apr 1985, *Aplin 128 et al.* (PERTH); Windjana Gorge, Napier Range, Jul 1974, *Carr 3865 & Beaglehole ACB47643* (NSW, PERTH); 1 mile [c. 1.6 km] from Calwynnyardah turnoff, Fitzroy road, Mar 1967, *Power 311* (PERTH); c. 6 km SE of Gibb River Road along road to Mt House Station, May 1985, *Aplin 991 et al.* (PERTH); Geikie Gorge N.P., Jul 1974, *Carr 3773 & Beaglehole ACB47551* (NSW, PERTH); Gogo [Station], Apr 1951, *Gardner 10016* (PERTH); E of junction of Kununurra – Wyndham – Halls Creek road, Jul 1974, *Carr 3201 & Beaglehole ACB46979* (NSW, PERTH); Ord River, NNW of Goosehole Yard, Bungle Bungle N.P., Jun 1989,

Menkhorst 933 (DNA). Northern Territory. Birrindudu Station, Jun 1994, *Egan 3826* (DNA).

Distribution and habitat: *Euphorbia cinerea* occurs in the southern Kimberley, WA from near Derby and eastward to adjacent parts of the NT (**Map 10**). It grows on red sand to loam soils on plains or floodplains in grassy open shrubland or woodland communities, or in stony red soils on hills in hummock grassland communities.

Phenology: Flowers and fruits have been collected from March to August.

Notes: *Euphorbia cinerea* resembles *E. albrechtii* and *E. petala*. For features distinguishing *E. cinerea* from *E. albrechtii* and *E. petala*, refer to the ‘Notes’ section under *E. albrechtii*.

This species has been misidentified as *E. drummondii* (e.g. Wheeler *et al.* 1992). It is easily distinguished from *E. drummondii* by its generally smaller habit, capsules and seeds, capsule shape and seed sculpturing.

The collection site on the type sheet (PERTH) is recorded as “Devil’s Pass” rather than Wingrah Pass, as recorded in Fitzgerald’s protologue for this species. Royce (in Wilson 1974) confirmed that the names refer to the same locality. Devil’s Pass is now known as Windjana Gorge.

11. *Euphorbia clementii* Domin, *Biblioth. Bot.* 89(4): 308–309 (1927 ‘1926’). **Type: [Western Australia.] inter Ashburton et DeGrey River, in 1900, *E. Clement s.n.* (holo: PR 528292).**

Monoecious, annual (?) to 60 cm high, few to many stems arising from base, the whole plant glabrous. **Stems** ascending to erect (rarely semiprostrate, *Mitchell PRP288* [PERTH]), sparingly to much branched, smooth. **Interpetiolar stipules** subulate, 0.5–1.5 mm long, deeply bipartite, glabrous; margin entire or lacinate. **Leaves:** petiole 1–2 mm long, smooth; blade oblong or oblong-obovate, 12–18 mm long, 5–9 mm wide, 2.1–2.3 times longer than wide; adaxial surface green, smooth; abaxial surface pale green, smooth; base symmetric, rounded; margin entire; apex rounded. **Cyathia** solitary at

the nodes, mostly on distal portion of stems. **Involucres** cupuliform, 1.5–2 mm long, 1.8–3.5 mm across; lobes 5, oblong or obovate, 1–1.3 mm long, margin deeply lacinate distally; glands 4, sessile, appressed to abaxial surface of involucre, patelliform, planar, transverse-elliptic to orbicular in outline, 0.8–1.1 mm long, 0.7–1.4 mm wide, yellowish green; gland appendages absent; bracteoles 1.3–1.6 mm long, divided into numerous \pm linear hirsute segments. **Staminate flowers** 60–75 per cyathium; pedicels 1.5–2 mm long; staminal filaments 0.4–0.8 mm long. **Pistillate flowers:** styles 0.7–1 mm long, ascending, smooth, glabrous, each bifid for c. 1/2 of their length, the apices clavate. **Capsules** exserted from involucre on pedicel to 6 mm long, broad-elliptic or transversely broad-elliptic in lateral view, 2.7–3 mm long, 3.2–3.5 mm across, deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** oblong or elliptic to broad-elliptic in outline, 1.9–2 mm long, 1.3–1.5 mm tangentially, 1.3–1.5 mm radially, trigonal to suborbicular in cross section; dorsal and ventral faces convex, smooth; exotesta thin, of even thickness, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta red-brown to brown. **Fig. 25J.**

Additional selected specimens examined: Western Australia. 20 km E [of] De Grey River crossing on Port Hedland/Broome Road, May 1991, *Thomson 3498* (AD, BRI, NT); HGM site 4, Y9 Crustal Deposit, Yarrle Iron Ore Mine site, c. 190 km E of Port Hedland, Apr 1998, *Maier s.n.* (PERTH 5086590); Gorge Creek, on Port Hedland – Marble Bar Road, Apr 2006, *Bean 25126* (BRI); Talga Gap, S of Coongan Siding, Jun 1941, *Burbidge 1053* (PERTH); 15.8 km N of Talga, Sep 1986, *Chinnock 6987* (AD); c. 37 km SE of Yandeyarra on southern access track from Great Northern Highway, Apr 1995, *Mitchell PRP288* (PERTH).

Distribution and habitat: *Euphorbia clementii* is confined to the Pilbara, north-western WA, occurring in an area more or less bounded by Port Hedland, Marble Bar and the Mungaroona Range (**Map 11**). It grows in *Triodia* grassland communities, on gravelly clay loam soils on slopes or stony rises or on sandy soils on plains. It is often noted on specimen labels to be growing in areas “recently burnt”.

Phenology: Flowers and fruits have been collected from April to June.

Notes: *Euphorbia clementii* is a distinctive species but appears most closely related to *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*. It is easily distinguished from all three species by its large, sessile, disk-like involucre glands that are appressed to the outside of the involucre cup (versus shortly stipitate involucre glands spreading radially from the involucre rim and perpendicular to the outside of the involucre cup for *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*), involucre lobes oblong or obovate, 1–1.3 mm long (versus triangular or subulate and 0.3–1.1 mm long for *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*) and more numerous staminate flowers per cyathia (60–75 per cyathia versus up to 35 per cyathia for *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*).

12. *Euphorbia coghlanii* F.M.Bailey, *Queensland Dept. Agric. Stock Bot. Bull.* 13: 12 (1896); *Chamaesyce coghlanii* (F.M.Bailey) D.C.Hassall ex P.I.Forst. & R.J.F.Hend., *Novon* 5: 323 (1995). **Type:** Queensland. GREGORY NORTH DISTRICT: Roxborough, Georgina River, December 1895, *F.M.Bailey s.n.* (holo: BRI [AQ342538]); **Epitype** (here chosen): Queensland. BURKE DISTRICT: 20 km (by road) E of Musselbrook Mining Camp on road to Ridgepole Waterhole, 175 km N of Camooweal – Lawn Hill National Park, 27 April 1995, *R.W.Johnson MRS379 & M.B.Thomas* (BRI).

Monoecious, annual or herbaceous perennial with short-lived stems produced from slender woody taproot, to 80 cm high, few to many stems arising from rootstock. **Stems** erect, sparingly to much branched, smooth, glabrous or with a sparse to moderately dense indumentum (pubescent or pilose); hairs \pm appressed or spreading, crispate, 0.1–0.4 mm long, white. **Interpetiolar stipules** narrow-triangular or subulate, 0.6–1.5 mm long, entire or bipartite, glabrous; margin entire or lacinate. **Leaves:** petiole 0.7–2 mm long, smooth, glabrous or with indumentum as for stems; blade oblong, lanceolate, narrow-ovate to broad-ovate or oblong-elliptic, 14–36 mm long, 2–10 mm wide, 2.2–9 times longer

than wide; adaxial surface subglaucous, dull green or pale green (often with reddish tinge), smooth, glabrous; abaxial surface glaucous or pale green, smooth, glabrous or sparsely hairy with appressed-ascending to ascending, \pm straight or crispate hairs 0.1–1 mm long; base asymmetric with one side cordate, the other rounded; margin entire or serrulate; apex acute to rounded. **Cyathia** solitary at the upper nodes, sometimes clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 1–9 mm long. **Involucres** campanulate or turbinate, 0.8–1.2 mm long, 1.1–1.3 mm across; lobes 5, triangular to subulate, 0.4–0.5 mm long, margin entire or lacinate; glands 4, stipitate, patelliform, planar to concave (rarely cupuliform with distinct central pit), transverse-elliptic to \pm orbicular in outline, 0.1–0.2 mm long, 0.1–0.6 mm wide, red or yellowish green; gland appendages conspicuous to inconspicuous, spreading radially, very broad-obovate to obdeltoid, 0.1–0.5 mm long, 0.5–0.9 mm wide, red or white, glabrous, margin entire; bracteoles 0.7–0.8 mm long, adnate for c. 1/4 of their length to involucre, free portion entire or divided into subulate glabrous segments. **Staminate flowers** 5–25 per cyathium; pedicels 1.1–1.4 mm long; staminal filaments 0.2–0.3 mm long. **Pistillate flowers:** styles 0.6–0.8 mm long, erect to spreading, recurved distally, smooth, glabrous, each bifid for 1/3–2/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 4 mm long, transversely broad-elliptic in lateral view, 1.8–2 mm long, 1.8–2.4 mm across, deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** oblong to ovate in outline, 1.2–1.4 mm long, 0.8–1 mm tangentially, 0.8–1 mm radially, suborbicular in cross section; dorsal and ventral faces convex, smooth; exotesta thin, of even thickness, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta red-brown to dark brown. *n* = 8. **Fig. 25K.**

Additional selected specimens examined: **Western Australia.** 10 km from Kununurra on road to Ivanhoe Springs, Apr 1985, *Aplin 568 et al.* (PERTH); 15 km S of Victoria Highway, 40 km E of Kununurra along Victoria Highway, Apr 1989, *Halford H51* (BRI);

Barrow Island, Oct 1980, *Buckley 6901* (PERTH); 2.4 km WSW of Coondewanna Hill, Hamersley Ranges, Jun 1997, *Trudgen 16673* (PERTH); c. 1 km S of Newman on Great Northern Highway, Mar 1994, *Mitchell PRP120* (PERTH); 1 km SSW of Erallinga Pool, Hamersley Ranges, Apr 1997, *Trudgen 15267* (PERTH); 4.75 km ESE of West Angela Hill, Hamersley Ranges, Jun 1997, *Trudgen 16729* (PERTH). **Northern Territory.** 2 km NW of Timber Creek, Dec 1994, *Barritt 1625* (DNA, MEL); Longreach Waterhole, Elliott, Feb 1988, *Thomson 2187* (AD, BRI); Muckaty, near homestead, Mar 1955, *Chippendale 1071* (BRI, DNA); Brunette Downs Station on stockroute to racecourse, Aug 1986, *Henshall 4127* (AD, DNA); 5 miles [c. 8 km] W of Frewena Roadhouse, Jul 1971, *Henry 194* (BRI); Soudan Station, No. 103 Bore, Nov 1986, *Henshall 4132* (DNA). **Queensland.** BURKE DISTRICT: Beames Brook on Burketown to Camooweal Road, May 2000, *Jago 5699 & Wannan* (BRI); 67 km WNW of Mt Isa, 6 km N of Mingera Creek, Apr 1989, *Harris 335* (BRI); Roxmere Station, S of Cloncurry, Apr 2003, *Booth 3179 & Kelman* (BRI); 2 km by road from Hughenden towards Winton, Apr 2006, *Halford Q9015 & Batianoff* (BRI). MITCHELL DISTRICT: 30 miles [c. 48 km] W of Blackall, May 1975, *Hassall 7530* (BRI). GREGORY NORTH DISTRICT: Bladensburg N.P., S of Winton and 2 km NE of Bladensburg homestead, Mar 1998, *Forster PIF22278 & Booth* (BRI, MEL). LEICHHARDT DISTRICT: 15 km SE of Capella, Mar 1995, *Fensham 2572* (BRI); 16 miles [c. 26 km] NW of Rolleston, May 1975, *Hassall 7536* (BRI).

Distribution and habitat: *Euphorbia coghlanii* occurs across northern Australia from the Pilbara and Kimberley, WA, extending through the northern central region of the NT, and eastward to central Qld (**Map 12**). It grows in grassland or open woodland communities, on mostly dark cracking clay soils rarely on sands, on plains, alluvial flats or along drainage lines. It has been rarely recorded in white coastal sands (*Buckley 6901* [PERTH]).

Phenology: Flowers and fruits have been collected throughout the year, particularly from January to August.

Notes: *Euphorbia coghlanii* is similar to *E. biconvexa* and *E. trigonosperma* but differs in having seeds that are suborbicular in transverse section versus lenticulate for *E. biconvexa* and trigonous for *E. trigonosperma*. It also differs from *E. trigonosperma* in habitat preference as well. *Euphorbia coghlanii* inhabits mostly dark cracking clay soils on plains, alluvial flats compared to sandy soils on coastal or inland dunes, in well-drained sandy soils on stony slopes of sandstone and limestone hills,

and in sandy alluvium along drainage lines.

The holotype of Bailey's *Euphorbia coghlanii* is in poor condition. It currently consists of a few almost leafless stems as well as a fragment packet containing a few fragmented leaves and stems, and a single cyathium. The Bailey collection (BRI [AQ342538]) as well as the illustration with the protologue of *E. coghlanii* lack sufficient details to fix the application of the name. As there is no other original material available to clarify the application of *E. coghlanii*, an epitype is here nominated. The collection *Johnson MRS379 & M.B. Thomas* (BRI [AQ 587084]) is chosen here as epitype. This collection has morphology that is similar to the remaining fragments of the original material and matches the description in the protologue.

13. *Euphorbia crassimarginata* Halford & W.K. Harris, **species nova** similis generatim *E. drummondii* Boiss. sed ab ea glandulis plerumque majoribus (0.2–0.3 × 0.4–0.5 mm) ore manifestioribus incrassatis appendicem petaloidam carens (ad vicem 0.15–0.2 × 0.2–0.4 mm glandulae appendicibus transversolinearis usque 1 mm longis) stylis 0.4–0.5 longis bifidis apicibus teretibus (ad vicem 0.2–0.3 mm longis integris vel vix bifidis) differt. **Typus:** Queensland. BURKE DISTRICT: 31 km by road from junction of Burke and Gulf Development Roads towards Flinders River, 16 January 2005, *K.R. McDonald KRM3414* (holo: BRI, iso: DNA, *distribuendi*).

Monoecious, annual to 40 cm high, with few stems arising from fibrous rootstock, the whole plant glabrous. **Stems** erect (rarely prostrate, *Pullen 8875* [BRI]), sparingly branched, longitudinally ridged. **Interpetiolar stipules** narrow-triangular, 0.7–1 mm long, deeply bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.5–0.8 mm long, smooth; blade narrow-oblong or narrow-ovate, sometimes falcate, 7.5–17 mm long, 1.7–3.4 mm wide, 3.6–5.9 times longer than wide; adaxial and abaxial surfaces green to pale green often with reddish tinge especially along margins, smooth or minutely papillose; base asymmetric with one side obtuse, the other rounded; margin sparsely minutely

toothed distally; apex obtuse or acute. **Cyathia** solitary at nodes, often clustered on short leafy lateral branchlets; peduncles 0.4–1 mm long. **Involucre** turbinate, 0.7–0.8 mm long, 0.8–0.9 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin fimbriate; glands 4, stipitate, cupuliform, with distinct central pit and thicken rim, transverse-elliptic or orbicular in outline, 0.2–0.3 mm long, 0.4–0.5 mm wide, red to purple; gland appendages absent; bracteoles subulate, 0.5–0.6 mm long, adnate for c. 1/3 of their length to involucre, glabrous. **Staminate flowers** 5 per cyathium; pedicels 0.7–0.8 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers**: styles 0.4–0.5 mm long, spreading, smooth, glabrous, each bifid for 1/3–2/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 1.8 mm long, broad-elliptic in lateral view, 1.7–1.9 mm long, 1.6–1.8 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** oblong-ovate in outline, 1.2–1.5 mm long, 0.7–0.8 mm tangentially, 0.7–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces concave; all faces with 3–6 faint to distinct transverse ridges; exotesta of uneven thickness, distinctly thicker on transverse ridges, white to pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown. *n* = 11. **Figs 3, 25L**.

Additional selected specimens examined: **Northern Territory.** 27 km SW [of] Daly Waters, Feb 1989, *Thomson 3147* (DNA); 22 km N [of] Ucharonidge homestead, Feb 1989, *Thomson 3246* (AD); Tanumbirini Station, Carpentaria Highway, Feb 1988, *Thomson 2203* (DNA). **Queensland.** BURKE DISTRICT: c. 20 miles [c. 32 km] W of Burketown, Jul 1974, *Hassall 7472* (BRI); c. 15 km SW of Normanton, along the road to Mogoura Station, Apr 1974, *Pullen 8875* (BRI); 28.4 km by road towards Flinders River from junction of Burke and Gulf Development Roads, Jan 2005, *McDonald KRM3449* (BRI); 5 km S of Normanton, May 1976, *Hassall 7633* (BRI); 15 km S of Normanton on Cloncurry road, 200 m W of highway, Apr 2004, *Thompson BUR157 & Newton* (BRI); near Eight Mile Creek, c. 40 km NNE of Normanton, on track c. 2.5 km off Burke Developmental Road, Jun 2001, *Turpin GPT873 & Thompson* (BRI); c. 70 miles [c. 113 km] S of Burketown, Jul 1974, *Hassall s.n.* (BRI [AQ475167]); 17.5 km N of Donors Hill turnoff, on Cloncurry – Normanton Road, May 1976, *Farrell TF414* (BRI); Bang Bang Jumpup on Cloncurry – Normanton Road, 105 km S of Normanton, Mar 1977, *Farrell TF793* (BRI); 90 km NNW of Mt Isa on remote

station track, May 2006, *Booth CAM08-10 & Kelman* (BRI); 54.7 km by road S of Flinders River road bridge, Mar 2005, *McDonald KRM4047* (BRI); 125.7 km by road S of Flinders River road bridge, Mar 2005, *McDonald KRM4059* (BRI). MITCHELL DISTRICT: Ventcher Station, 82 km SW of Torrens Creek, Apr 2005, *Thompson TAN208 & Booth* (BRI); 83 km SSE of Torrens Creek on Jednock Station, Apr 2005, *Thompson TAN236 & Booth* (BRI).

Distribution and habitat: *Euphorbia crassimarginata* extends from Daly Waters, NT, eastward to near Hughenden, Qld (**Map 13**). It grows in eucalypt or *Melaleuca* open woodland, or *Acacia* woodland communities, on plains or low lateritic hills, and in Mitchell grassland on plains. The soils are variable in texture: sand, clay loam to cracking clays.

Phenology: Flowers and fruits have been collected from January to July.

Notes: *Euphorbia crassimarginata* bears a general resemblance to *E. drummondii* but differs from it by having generally larger glands (0.2–0.3 × 0.4–0.5 mm) with more pronounced thickened rim and lacking a petaloid appendage (versus 0.15–0.2 × 0.2–0.4 mm, gland appendages present, transverse-linear, to 0.1 mm long for *E. drummondii*), and styles 0.4–0.5 mm long, each bifid for 1/3–2/3 of their length, the apices terete (versus 0.2–0.3 mm long, each entire or scarcely bifid, the apices clavate for *E. drummondii*).

Etymology: The specific epithet is from Latin *crassus*, thick, and *-marginatus*, margined, in reference to the thickened margin of the involucre glands of the species.

14. *Euphorbia dallachyana* Baill., *Adansonia* 6: 285–286 (30 July 1866); *Chamaesyce dallachyana* (Baill.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type: Queensland. [PORT CURTIS DISTRICT:] Rockhampton, *s.d.*, [*J.Dallachy s.n.*] (holo: P 313101; iso: MEL 68199).**

Euphorbia minutifolia Boiss., in A.DC., *Prodr.* 15(2): 1263 (late August 1866). **Type:** [Queensland. COOK DISTRICT:] Gulf of Carpentaria, *s.d.*, [*W.Landsborough s.n.*] (holo: G-DC *n.v.* [microfiche IDC 800-73. 2421: II. 8]; iso: MEL 68205, 68204).

Illustration: Auld & Medd (1987: 160).

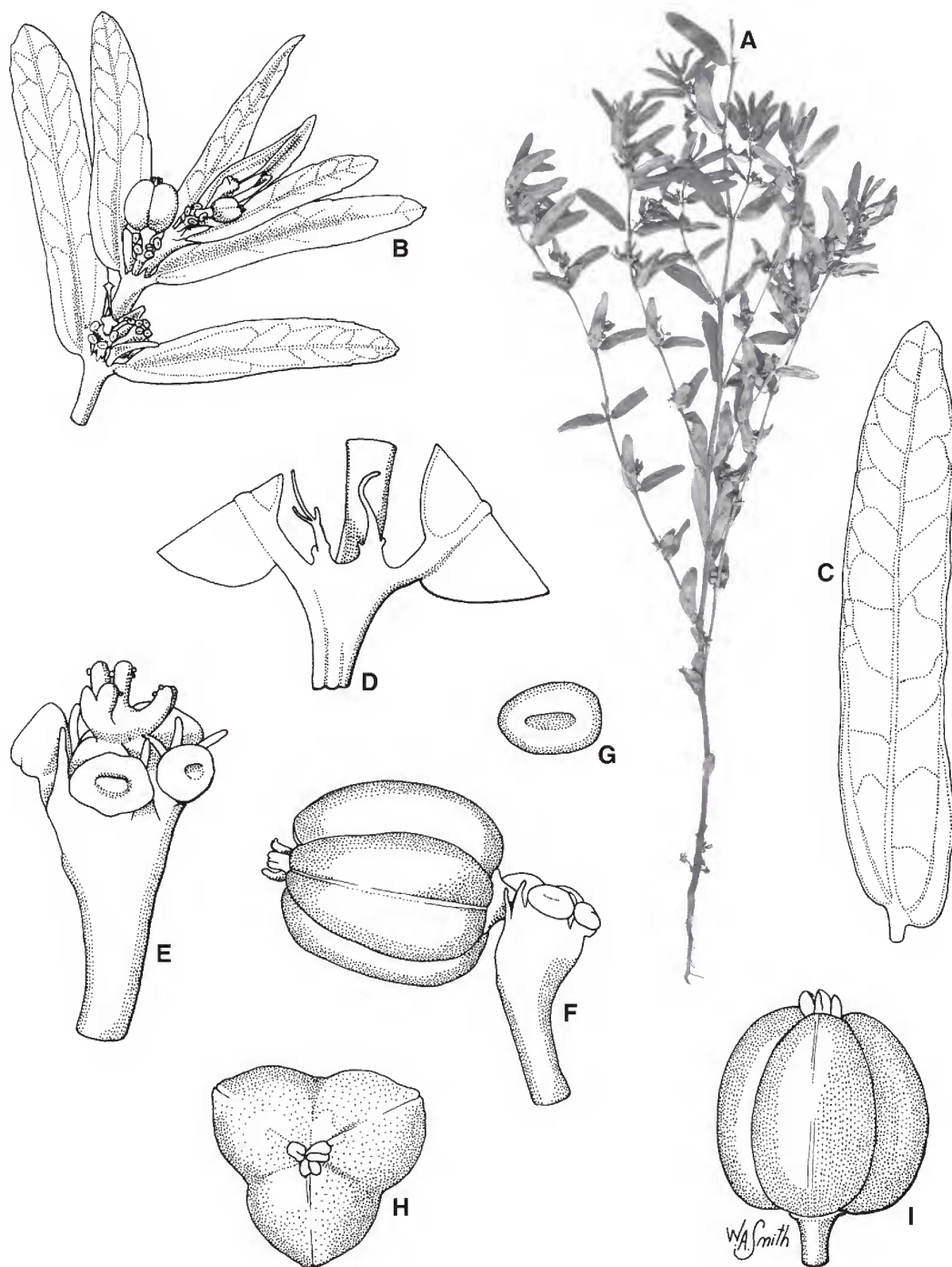


Fig. 3. *Euphorbia crassimarginata*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 4$. C. leaf $\times 4$. D. stipules $\times 12$. E. cyathia with female flower $\times 32$. F. capsule with cyathia $\times 16$. G. cyathial gland, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A from McDonald KRM3414 (BRI); B–I from McDonald KRM3449 (BRI). Del. W.Smith.

Monoecious, annual or herbaceous perennial with short-lived stems produced from slender woody taproot, to 5(20) cm high, many stems arising from rootstock, the whole plant glabrous. Stems prostrate (rarely ascending to erect), much branched, smooth. **Interpetiolar stipules** triangular to broad-triangular, 0.2–1.1 mm long, entire or bipartite, glabrous; margin lacerate. **Leaves:** petiole 0.5–1.5 mm long, smooth; blade oblong, ovate, obovate to broad-obovate, elliptic to broad-elliptic or subrotund, 2–9 mm long, 1.3–7 mm wide, 1–2 times longer than wide; adaxial and abaxial surfaces green or blue-green (sometimes tinged red especially along margins), smooth (rarely minutely papillose); base asymmetric with one side rounded to cordate, the other obtuse to rounded; margin entire or minutely toothed distally; apex obtuse, mucronate or retuse. **Cyathia** solitary at the nodes; peduncles 0.5–5 mm long, smooth. **Involucres** turbinate, 0.6–0.9 mm long, 0.5–1 mm across; lobes 5, triangular to subulate, 0.2–0.4 mm long, margin fimbriate; glands 4, stipitate, cupuliform, with a shallow central pit, transverse-oblong, or transverse-elliptic in outline, 0.1–0.2 mm long, 0.2–0.4 mm wide, pink or pale green; gland appendages conspicuous to inconspicuous, spreading radially, transverse-linear, 0.05–0.3 mm long, 0.2–0.6 mm wide, pink or white, glabrous, margin entire or shallowly lobed; bracteoles 0.5–0.8 mm long, adnate for 1/3 of their length to involucre, free portion divided into few to numerous subulate glabrous or hirsute segments. **Staminate flowers** 5–10 per cyathium; pedicels 0.6–1 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.1–0.4 mm long, spreading to erect, smooth, glabrous, bifid for up to 1/2 of their length, the apices clavate or terete. **Capsules** exserted from involucre on pedicel to 2.2 mm long, transversely broad-elliptic in lateral view, 1.5–2.2 mm long, 1.5–2.4 mm across, shallowly 3-lobate with keels obtuse, smooth; hypogynous disc lacinate or entire. **Seeds** ovate or broad-ovate in outline, 1.1–1.5 mm long, 0.8–0.95 tangentially, 0.7–0.9 mm radially, tetraquetrous or tetragonous in cross section; dorsal and ventral faces planar to convex, with 2–4 faint transverse ridges;

exotesta thin, of even thickness, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta brown or red-brown. $n = 11, 22$. **Fig. 25M.**

Additional selected specimens examined: **Western Australia.** Fitzroy River, Great Northern Highway, Broome – Derby Road, Jul 1974, *Carr 4305 & Beaglehole 48083* (NSW; PERTH); corner of Kargotich & Mundijong Roads, Mundijong, May 2009, *Hislop 3880* (BRI, MICH). **Northern Territory.** Dashwood Crossing, Jul 1995, *Booth 1031* (DNA); Kalkaringi, Mar 1990, *Thomson 3492* (DNA); Lake Nash Station, Beantree Bore, Jul 2000, *Risler 472* (DNA); between Top Springs & Timber Creek, Jul 1974, *Carr 2739 & Beaglehole 46518* (MEL, NSW). **Queensland.** BURKE DISTRICT: Gregory River crossing, Riversleigh Station, May 1990, *Latz 11639* (DNA). SOUTH KENNEDY DISTRICT: 5 km from Moray Downs homestead on Clermont Road, May 1995, *Forster PIF16701 & Figg* (BRI). PORT CURTIS DISTRICT: Glen Geddes, c. 45 km NNW of Rockhampton, Nov 2003, *Halford Q8076 & Forster* (BRI, MEL, NSW). MORETON DISTRICT: Blenheim, W of Laidley, Dec 2004, *Forster PIF30528* (BRI); White Swamp Road, S of Boonah, Mar 2004, *Bean 21752* (BRI). **South Australia.** c. 6 km S of Blanchetown, Feb 1973, *Weber 3521* (AD); c. 1 km NW of Big Bend S of Swan Reach, Apr 1973, *Donner 4123* (AD); Adelaide Botanic Gardens, Car Park, Jan 1992, *Smith 2958* (AD). **New South Wales.** 0.4 km S of Gurley Creek, on Moree – Narrabri Road, Jan 1996, *Bean 9509* (BRI, MEL, NSW); alongside Ironbark Creek, W of Woodsreef Mine, Mar 1994, *Hosking 958* (MEL, NSW); Buchanan Lamington Colliery, 4.8 km from Warkworth, Jun 1975, *Coveny 6554 & Powell* (NSW); 10 km W of Balranald, Dec 1987, *Thomson 2300* (NSW [mixed collection with *E. serpens*], NT); 20.9 km SE along Aratula Road towards Tocumwal off the Deniliquin – Finley Road, Apr 1988, *Coveny 12903 et al.* (MEL, NSW). **Victoria.** 1.5 km NE [of] Colignan, Apr 1983, *Forbes 1416* (MEL); Johnson's Bend, Murray River near Mildura, May 1969, *Craven 1575* (MEL); Yarrawonga, Jan 1982, *Aston 2180* (MEL).

Distribution and habitat: *Euphorbia dallachyana* is widespread in eastern Australia with scattered localities in northern and south-western WA, and north-western NT (**Map 14**). It grows in grassland, eucalypt woodland/open forest communities on plains, alluvial flats or river and creek banks, rarely on rocky hillsides. The soils vary from sand to cracking clays. It is often recorded in disturbed areas such as roadsides, in urban parklands, along railways, pastures and cultivated land.

Phenology: Flowers and fruits have been collected throughout the year, particularly from November to May.

Notes: *Euphorbia dallachyana* is characterised by the lack of an indumentum; stems not longitudinally ridged; stipules triangular to broad-triangular; glands cupuliform with a shallow central pit; gland appendages always present although small (to 0.3 mm long) and transverse-linear with margin entire or shallowly lobed; seed surfaces with 2–4 faint transverse ridges; capsules transversely broad-elliptic in lateral view.

Bentham (1873) placed *Euphorbia dallachyana* in synonymy under *E. drummondii*. Hassall (1976) reinstated it to specific rank (as *Chamaesyce dallachyana*). *Euphorbia dallachyana* is similar to *E. drummondii* in its involucre glands, gland appendages, and capsule shape and size. It differs from that species in its leaf form and stipule form, and seed surface sculpturing.

Euphorbia dallachyana as circumscribed here is variable in style and hypogynous disc morphology. The typical variant occurs widely throughout the species distributional range although it is more common in the northern part of the range. It has styles bifid for c. 1/2 of their length with the apices \pm terete and the hypogynous disc with a laciniate fringe. The hypogynous fringe is not always present at the base of all capsules on the one plant and can vary from just a few slender subulate lobes to a much divided broad lobe (e.g. *Hislop* 3880, *Hosking* 958, *Smith* 2958, *Halford* Q8076 & *Forster*). Hassall (1977) records this typical variant as a tetraploid with a base chromosome number $n = 22$.

A second variant occurring in the southern part of the species range (through NSW, SA, Vic and WA) has styles that are bifid for up to 1/3 of their length with \pm erect, stout clavate apices and the hypogynous disc undivided (e.g. *Donner* 4123, *Craven* 1575, *Coveny* 12903 *et al.*, *Aston* 2180). This variant was referred to *E. drummondii* (as *Chamaesyce drummondii*) by Hassall (1977) who recorded a chromosome number $n = 11$. We believe that this variant is better placed under *E. dallachyana* as it is morphologically similar in seed sculpturing, and stipule and leaf form. Further collections and field studies are

warranted to establish the significance of this variation.

15. *Euphorbia drummondii* Boiss., *Cent. Euphorb.* 14 (1860); *E. drummondii* Boiss. var. *drummondii*, Baillon, *Adansonia* 6: 285 (1866); *Chamaesyce drummondii* (Boiss.) Soják, *Čas. Nár. Muz., Odd. Přír.* 140: 169 (1972). **Type:** [Western Australia.] Swan River, *s.d.*, [*J.*] *Drummond* 670 (holo: G 191672 *n.v.* [image seen]; iso: G 191671 *n.v.* [image seen], K 186497, P 313102).

Monoecious, annual or herbaceous perennial with short-lived stems produced from slender woody taproot, to 15 cm high, few to many stems arising from rootstock, the whole plant glabrous. **Stems** prostrate or erect, sparingly branched, longitudinally ridged. **Interpetiolar stipules** subulate, 0.5–0.9 mm long, deeply bipartite, glabrous; margin laciniate. **Leaves:** petiole 0.5–1.1 mm long, smooth; blade narrow-oblong to oblong, broad-ovate or oblanceolate, sometimes slightly falcate, 4.5–16 mm long, 2.3–5 mm wide, 1.7–5 times longer than wide; adaxial and abaxial surfaces blue-green or red, smooth (rarely minutely papillose); base asymmetric with one side cordate, the other obtuse to rounded; margin serrulate; apex rounded. **Cyathia** solitary at the upper nodes, often clustered on short leafy lateral branchlets; peduncles c. 0.7 mm long. **Involucres** campanulate, 0.6–0.7 mm long, 0.8–1 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin entire or fimbriate; glands 4, stipitate, cupuliform, with distinct central pit and thickened rim; transverse-oblong or orbicular in outline, 0.15–0.2 mm long, 0.2–0.4 mm wide, yellow; gland appendages inconspicuous, spreading radially, transverse-linear, to 0.1 mm long, 0.4–0.5 mm wide, white, glabrous, margin entire; bracteoles 0.5–0.6 mm long, adnate for c. 1/5 of their length to involucre, free portion divided into few to numerous, subulate hirsute segments. **Staminate flowers** 5–8 per cyathium; pedicels 0.7–1.1 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, ascending, smooth, glabrous, entire or scarcely bifid, the apices clavate. **Capsules** exserted from involucre on pedicel to 2.5 mm long, broad-elliptic in

lateral view, 1.6–1.8 mm long, 1.7–1.9 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** oblong-ovate in outline, 1.1–1.6 mm long, 0.8–0.9 mm tangentially, 0.7–0.9 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces concave; all faces with 3–6 distinct transverse ridges; exotesta thin, of \pm even thickness over surface, grey-white, microreticulate or minutely granulate, becoming mucilaginous when moistened; endotesta red-brown. $n = 11$. **Figs 4, 25N.**

Additional selected specimens examined: **Western Australia.** Karijini N.P., 9.2 km E of Mt Bruce, 8.5 km S of Mt Oxeer, 8.7 km WNW of Mt Howieson, Mt Bruce Flats, May 1992, *van Leeuwen 1185* (PERTH); 9 km N of West Angela Hill, Hamersley Ranges, Jul 1997, *Trudgen 16679* (PERTH); 33 miles [c. 53 km] NE of Cosmo Newbery on road to Warburton, Aug 1962, *George 3755* (PERTH); Kurradjong Rockhole, N end of Hunt Range, May 1978, *Keighery 1747* (PERTH); near Cunderdin, Feb 1963, *Aplin 2205* (MEL, PERTH); Lapsley's property, near Dulyalbin Rock, S of Moorine Rock, Jan 1984, *Dodd 91* (PERTH). **Northern Territory.** Simpson Gap, Feb 2009, *Albrecht 12733* (BRI); Heavitree Range, base of road to Telecom West Gap Tower road, Nov 1986, *Thomson s.n.* (DNA A80432); SE [of] White Range, Arltunga Historical Reserve, May 1980, *Kalotas 482* (DNA); Kings Canyon, 'Garden of Eden', Jul 1981, *Thomson 45* (DNA). **Queensland.** MITCHELL DISTRICT: c. 9.5 km E of Warang homestead, site on track to the Sandstone Wall. White Mountains N.P., 57 km by road N from Torrens Creek, Apr 2000, *Thomas 1483 & Thompson* (BRI); Leander Station, Longreach, Apr 1977, *Greenfield JT893* (BRI); Milo Station, NNW of Adavale, Aug 2009, *Forster PIF35305 & Thomas* (BRI). LEICHHARDT DISTRICT: near junction of Old Rig road and Mapala – Glenhaughton Road, c. 75 km NW of Taroom, Mar 2004, *Halford Q8214 & Edginton* (BRI); 60 km WNW of Taroom, Glenhaughton Road, Mar 2004, *Halford Q8191 & Edginton* (BRI). WARREGO DISTRICT: 5 km SE of Charleville, Mulga Master site, Charleville experimental Reserve, Apr 1972, *Everist 9842* (BRI). MARANO DISTRICT: 11 km SE of Gradule, W of Goondiwindi, Sep 2001, *Bean 17825* (BRI). **New South Wales.** Mulwarrina Creek, Mulgowen Station, 35 miles [c. 56 km] S of Bourke, Oct 1963, *Constable 4568B* (NSW); N side of Mt Gunderbooka, Nov 1987, *Wilson 163 & Wilson* (NSW); 5.6 km W of Girilambone, Mitchell Highway between Nyngan and Coolabah, Aug 1987, *Wiecek 35 et al.* (NSW); 4 miles [c. 6 km] NW of Girilambone, on Mitchell Highway, Sep 1968, *Thompson s.n.* (NSW 520554); Forbes District, Apr 1899, *Cox s.n.* (NSW 541459).

Distribution and habitat: *Euphorbia drummondii* occurs widely and disjunctly across mainland Australia from the Pilbara region and south-western WA, through

southern NT to central and southern Qld, and northern NSW (**Map 15**). It grows in open eucalypt/*Acacia* dominated communities on well drained sandy to clay-loam soils, usually on rocky hills, plains and alluvial flats.

Phenology: Flowers and fruits have been collected throughout the year, particularly from March to August.

Typification: The isotype (*Drummond 670*) at Kew consist of two sheets (186497, 186498). The specimen on sheet 186497 matches the holotype and isotypes at G and P, while specimen on sheet 186498 is referable to *E. dallachyana* as applied here.

Notes: *Euphorbia drummondii* is characterised by the following features: the whole plant glabrous, stems longitudinally ridged, glands cupuliform with distinct central pit and thickened rim, gland appendages although small (to 0.1 mm long) always present, transverse-linear with entire margins; seed surfaces with 3–6 distinct transverse ridges, capsules broad-elliptic in lateral view, and styles short (0.2–0.3 mm long), entire or scarcely bifid with somewhat thick clavate apices.

The name *Euphorbia drummondii* has been widely applied in the past. This wide application of the name starts with Bentham (1873) whose concept of *E. drummondii* included three previously recognised species (*E. ferdinandi*, *E. dallachyana*, *E. sharkoensis*). The need to recognise a wider range of taxa has become obvious from the specimens collected since Bentham's work. Fitzgerald (1918), Ewart & Kerr (1926), Domin (1927) and Hassall (1977) started to unravel this unwieldy complex when they reinstated previously named species or described new ones. Hassall (1977) proposed a number of subspecies and varieties for the species, but these were never validly published. We have reinstated *E. ferdinandi* and *E. sharkoensis* as distinct species and recognised eleven new species that have not previously been recognised as distinct from *E. drummondii*. These are: *E. albrechtii*, *E. flindersica*, *E. gregoriensis*, *E. hassallii*, *E. multifaria*, *E. papillata*, *E. papillifolia*, *E. philochalix*, *E. porcata*, *E. verrucitesta* and *E. victoriensis*.



Fig. 4. *Euphorbia drummondii*. A. habit $\times 0.8$. B. branchlet with cyathia $\times 4$. C. leaf $\times 4$. D. stipules $\times 12$. E. cyathia with female flower $\times 24$. F. capsule with cyathia $\times 16$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A & C from *Halford Q8191 & Edginton* (BRI); B, D–I from *Forster PIF35305 & Thomas* (BRI). Del. W. Smith.

16. *Euphorbia ferdinandi* Baill., *Adansonia* 6: 284–285 (1866). **Type:** [New South Wales.] Mt Goningberri [Koonenberry Mountain], 31 December 1860, NE Exped. [*H. Beckler s.n.*] (holo: P 313103; iso: MEL 2179535).

Monoecious, herbaceous perennial, to 10 cm high, few to many annual stems arising from woody taproot, the whole plant glabrous. **Stems** prostrate or decumbent to ascending, sparingly to much branched,

smooth or sometimes longitudinally ridged. **Interpetiolar stipules** subulate, narrow-triangular or triangular, 0.3–1.2 mm long, bifid or deeply bipartite, glabrous; margin shallowly to deeply lacinate. **Leaves:** petiole 0.2–0.8 mm long, smooth; blade obovate, oblong-obovate, oblong or elliptic, 3–8 mm long, 1.4–4.2 mm wide, 1.4–2.5 times longer than wide; adaxial and abaxial surfaces green or blue-green (sometimes with reddish tinge especially on margins), smooth or papillose; base asymmetric with one side cordate to rounded, the other cuneate to obtuse; margin sparingly minutely toothed distally or entire; apex rounded. **Cyathia** solitary at the nodes, sometimes clustered on short leafy lateral branchlets; peduncles 0.2–0.5 mm long. **Involucres** turbinate to campanulate, 0.5–0.9 mm long, 0.6–1 mm across; lobes 5, triangular, 0.15–0.5 mm long, margin entire or fimbriate; glands 4, stipitate, cupuliform, with distinct central pit and thickened rim, transverse-elliptic or orbicular in outline, 0.1–0.3 mm long, 0.1–0.4 mm wide, pink, orange to red or yellowish green; gland appendages mostly absent, rarely present, spreading radially, transverse-linear, to 0.1 mm long, 0.3–0.4 mm wide, red or white, glabrous, margin entire; bracteoles 0.5–0.8 mm long, adnate for 1/3 of their length to involucre, free portion either an entire subulate glabrous lobe or divided into few to numerous subulate glabrous or hirsute segments. **Staminate flowers** 3–5 per cyathium; pedicels 0.7–1 mm long; staminal filaments *c.* 0.1 mm long. **Pistillate flowers:** styles 0.2–0.4 mm long, spreading or ascending to erect, smooth, glabrous, entire (rarely scarcely bifid, Halford Q9212 [BRI]), the apices terete or

clavate. **Capsules** exserted from involucre on pedicel to 1.7(2.5) mm long, elliptic in lateral view, 1.4–2.1 mm long, 1.2–1.7 mm across, shallowly 3-lobate with keels obtuse to acute, smooth or papillose, glabrous; hypogynous disc entire. **Seeds** narrow-ovate in outline, 1.1–1.6 mm long, 0.5–0.7 mm tangentially, 0.4–0.6 mm radially, tetraquetrous in cross section; dorsal faces planar or concave; ventral faces concave; all faces smooth; exotesta thin, of even thickness, pale brown or white, microreticulate or minutely granulate, becoming mucilaginous when moistened; endotesta brown or red-brown.

Distribution: *Euphorbia ferdinandi* is widespread in arid Australia from near Wiluna and Laverton, WA, eastward through the NT and SA to western Qld and north-western NSW, with disjunct populations near Tom Price, Pilbara, WA.

Notes: Bentham (1873) placed *Euphorbia ferdinandi* in synonymy under *E. drummondii*. Subsequently the name *E. drummondii* has been widely applied to this species. *Euphorbia ferdinandi* differs from *E. drummondii*, in having smooth seeds (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*) and capsules distinctly longer than wide (capsules elliptic in lateral view, 1.4–2.1 × 1.2–1.7 mm versus broad-elliptic in lateral view, 1.6–1.8 × 1.7–1.9 mm for *E. drummondii*).

As recognised here, *E. ferdinandi* is variable in degree of gland appendage development and size of capsules and seeds. This has led us to recognise three varieties which can be distinguished by the following key.

Key to varieties of *Euphorbia ferdinandi*

- | | | |
|----|--|---|
| 1 | Gland appendages present | 16b. <i>E. ferdinandi</i> var. <i>appendiculata</i> |
| 1. | Gland appendages absent | 2 |
| 2 | Capsules 1.4–1.9 × 1.3–1.7 mm, <1.3 times long as wide, distinctly minutely papillose (visible at 40× mag.); seeds 1.1–1.3 mm long | 16a <i>E. ferdinandi</i> var. <i>ferdinandi</i> |
| 2. | Capsules 1.8–2.1 × 1.2–1.5 mm, ≥1.3 times as long as wide, faintly minutely papillose (visible at 40× mag.); seeds 1.4–1.6 mm long | 6c. <i>E. ferdinandi</i> var. <i>saxosiplaniticola</i> |

16a. *Euphorbia ferdinandi* var. *ferdinandi*

Stems prostrate or decumbent, sometimes longitudinally ridged. **Leaves:** petiole 0.2–0.8 mm long; blade obovate or oblong-obovate, 3.4–8 mm long, 1.4–4.2 mm wide, 1.9–2.5 times longer than wide; adaxial and abaxial surfaces papillose; margin sparingly minutely toothed distally or entire. **Involucres** turbinate to campanulate, 0.7–0.8 mm long, 0.8–1 mm across; gland appendages absent. **Pistillate flowers:** styles 0.2–0.4 mm long, entire or rarely scarcely bifid, with terete apices. **Capsules** 1.4–1.9 mm long, 1.3–1.7 mm across, papillose (sometimes only minutely so and may appear smooth without 40× mag.). **Seeds** 1.1–1.3 mm long, 0.5–0.7 mm tangentially, 0.5–0.6 mm radially. *n* = 11. **Figs 5, 250.**

Additional selected specimens examined: Western Australia. Warburton, Oct 1963, *de Graff s.n.* (PERTH 2437104); Mt Eveline, E of Warburton, Aug 1962, *George 3869* (PERTH); 28 miles [c. 45 km] N of Warburton, Jul 1963, *George 5315* (PERTH); 35 km W of NT/WA border on Lasseter Highway, Apr 1992, *Zich 46* (NSW). **Northern Territory.** Barkly Highway, May 1993, *Egan 2232* (DNA); Stirling/Ti Tree boundary, May 1979, *Kalotas 354* (DNA); Hermannsburg Road, 52 km E of Hermannsburg, Aug 1988, *Barritt 454* (DNA); eastern Golfcourse suburb, 4 km E Alice Springs, Mar 1988, *Barritt 22* (DNA, MEL); Hamilton Downs Road, 14 miles [c. 22 km] NW [of] Alice Springs, Jan 1964, *Nelson 843* (DNA, NSW); Finke Road, 6 km E of Wellmullinna Creek, Aug 1988, *Barritt 602* (DNA, MEL). **Queensland.** BURKE DISTRICT: 12.5 km SE of Malbon, May 1985, *Neldner 1687 & Stanley* (BRI). GREGORY NORTH DISTRICT: Moonah Creek, 7 km E of Oban homestead, May 1985, *Neldner 2250 & Stanley* (BRI). WARREGO DISTRICT: Currawinya N.P., Thargomindah turnoff on Eulo to Hungerford Road, Mar 1997, *Forster PIF20367 & Watson* (BRI). GREGORY SOUTH DISTRICT: 117 miles [c. 188 km] NW of Quilpie on Windorah Road, May 1975, *Hassall 7514* (BRI). **South Australia.** c. 6.5 km by road NNE of turnoff from Pipalyatjara road, on road to Waljitjata, Tomkinson Ranges, Sep 1978, *Stove 487* (AD); Patchawara Bore, Innamincka Station, Nov 1987, *Conrick 2220* (AD, MEL); 13.5 km by road SSE of Duff Creek crossing and 52 km NNW of William Creek Hotel on Oodnadatta track, Mar 1984, *Donner 9924* (AD); 3 km N of Carl Dour Tank, Mobella Station, Aug 1995, *Badman 7920* (AD); 23 km SE of Lake Bring, Oct 1987, *Symon NPWS1443* (AD). **New South Wales.** Depot Glen, 12 km N of Milparinka, Oct 1976, *Pickard 3142* (NSW); Stud Creek, Gorge Loop Road, Sturt N.P., Aug 1991, *Duncan s.n.* (NSW 249230).

Distribution and habitat: *Euphorbia ferdinandi* var. *ferdinandi* is widespread

in central Australia from near Wiluna and Laverton, WA, eastward through NT and SA to western Qld and north-western NSW, with disjunct populations near Tom Price, Pilbara, WA (**Map 16a**). It grows on sandy to sandy loam soils in *Acacia* shrubland/woodland or hummock grassland communities, mostly on plains or along watercourses, rarely on sandstone escarpments.

Phenology: Flowers and fruits have been collected throughout the year, particularly from May to October.

16b. *Euphorbia ferdinandi* var. *appendiculata* Halford & W.K.Harris, **varietas nova** ab aliis varietatibus *E. ferdinandi* Baill. appendicibus glandulis praesentibus et etiam habitu foliisque minoribus differt. **Typus:** Queensland. GREGORY NORTH DISTRICT: 42 km S along Old Cork Road from Winton – Boulia Road, 24 September 2005, *D.Halford Q8604 & M.B.Thomas* (holo: BRI; iso: AD, MEL).

Stems prostrate or rarely decumbent to ascending, longitudinally ridged. **Leaves:** petiole 0.3–0.7 mm long; blade oblong or elliptic, 3–6 mm long, 1.6–3.6 mm wide, 1.4–2 times longer than wide; adaxial surface smooth (rarely faintly papillose); abaxial surface smooth; margin entire. **Involucres** campanulate, 0.5–0.8 mm long, 0.6–0.8 mm across; gland appendages inconspicuous, transverse-linear, to 0.1 mm long, 0.3–0.4 mm wide. **Pistillate flowers:** styles 0.2–0.3 mm long, entire, with clavate apices. **Capsules** 1.7–2 mm long, 1.3–1.6 mm across, smooth or rarely faintly papillose. **Seeds** 1.3–1.4 mm long, 0.5–0.6 mm tangentially, 0.5–0.6 mm radially. *n* = 11. **Fig. 25P.**

Additional selected specimens examined: **Northern Territory.** Hamilton Downs Station, Jan 1987, *Thomson 1736* (DNA); Burt Plain, 60 km N of Alice Springs, Sep 1986, *Thomson 1468* (DNA). **Queensland.** MITCHELL DISTRICT: Idalia N.P., SW of Blackall, Jun 1990, *Rogers s.n.* (BRI [AQ624140]). GREGORY NORTH DISTRICT: Diamantina N.P., track to Scotts Tank, Apr 1997, *Forster PIF20678 & Holland* (BRI); 153 km S of Boulia, May 1976, *Hassall 7649* (BRI). WARREGO DISTRICT: c. 40 miles [c. 64 km] S of Charleville on Cunnamulla Road, Aug 1973, *Hassall 7384* (BRI); Currawinya N.P., Paroo River floodplain south of Caiwarra ruins, Mar 1997, *Forster PIF20507 & Watson* (BRI); Currawinya N.P., north of Hungerford, Apr 1994, *Swain 604* (BRI); 33.5

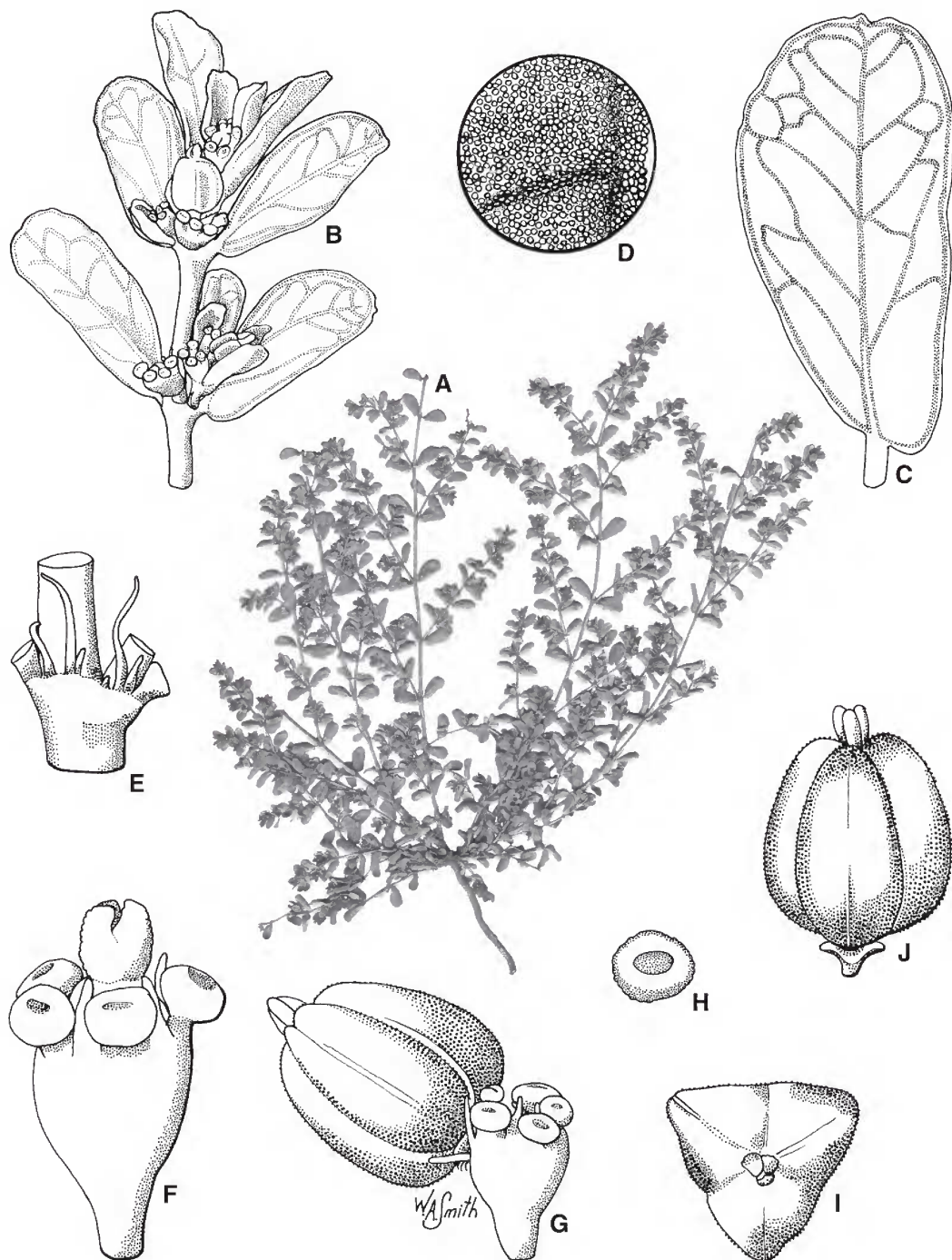


Fig. 5. *Euphorbia ferdinandi* var. *ferdinandi*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 6$. C. leaf $\times 8$. D. papillae on lower leaf surface $\times 32$. E. stipules $\times 16$. F. cyathia with female flower $\times 32$. G. capsule with cyathia $\times 16$. H. cyathial gland, adaxial view $\times 32$. I. capsule, top view $\times 16$. J. capsule, lateral view $\times 16$. A from *Barritt 454* (DNA); B–J from *Kalotas 354* (DNA). Del. W.Smith.

km E of Eulo, towards Cunnamulla, Aug 2006, *Bean 25669* (BRI). GREGORY SOUTH DISTRICT: c. 9 km due W of Tickalara homestead, c. 170 km SW of Thargomindah, 1995, *Kemp 895 & Fairfax* (BRI). **South Australia**. 25.7 km from Birdsville road, E of Macumba homestead, Browns Creek, Sep 1986, *Ballingall 2238* (BRI); c. 65 km N of Innamincka, Aug 1975, *Weber 4680* (AD); Marree, Jun 1930, *George s.n.* (AD 98597032); Myall Well, Andamooka Station, Oct 1989, *Badman 3862* (AD). **New South Wales**. walking track c. 2.25 km from Mt Wood summit, Sturt N.P., Sep 1989, *Wiecek 313 et al.* (NSW); Rossmore Station, 20 miles [c. 32 km] NE of Bourke, Oct 1963, *Constable 4481* (NSW).

Distribution and habitat: *Euphorbia ferdinandi* var. *appendiculata* occurs from near Alice Springs, NT, north east to Julia Creek, Qld, south to north-eastern SA and east to Bourke, western NSW (**Map 16b**). It commonly grows in grassland communities on cracking clay soils, or chenopod shrubland communities on stony clay soils on plains or alluvial flats.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia ferdinandi* var. *appendiculata* differs from the other varieties by having gland appendages and it is also generally smaller in habit and leaves.

Etymology: The varietal epithet is Latin *appendiculatus*, with small appendages, in reference to the presences of gland appendages in this variety.

16c. *Euphorbia ferdinandi* var. *saxosiplaniticola* Halford & W.K.Harris, **varietas nova** ab *E. ferdinandi* Baill. var. *ferdinandi* capsulis angustioribus et plerumque longioribus 1.8–2.1 × 1.2–1.5 mm ≥1.3 plo longioribus quam latioribus tantum minute papillosis (in vicem 1.4–1.9 × 1.3–1.7 mm <1.3 plo longioribus quam latioribus distincte minute papillosis), seminibus longioribus 1.4–1.6 mm longis (in vicem 1.1–1.3 mm longis) necnon *E. ferdinandi* var. *appendiculata* Halford & W.K.Harris appendices glandulae carens differt. **Typus:** South Australia. Poonia Waterhole, 5 September 1986, *J.S.Weber 9140* (holo: AD; iso: three duplicates to be distributed).

Stems prostrate or decumbent. **Leaves:** petiole 0.3–0.5 mm long; blade oblong, obovate or elliptic, 4.2–7 mm long, 2.1–3

mm wide, 2.3–2.5 times longer than wide; adaxial and abaxial surfaces smooth; margin entire or sparingly minutely toothed distally. **Involucres** turbinate, 0.8–0.9 mm long, 0.6–0.7 mm across; gland appendages absent. **Pistillate flowers:** styles 0.2–0.3 mm long, entire, with terete apices. **Capsules** 1.8–2.1 mm long, 1.2–1.5 mm across, smooth or faintly papillose. **Seeds** 1.4–1.6 mm long, 0.5–0.7 mm tangentially, 0.4–0.5 mm radially. **Fig. 25Q.**

Additional selected specimens examined: **Northern Territory.** Allittra Tableland, Simpson Desert, Aug 1992, *Latz 12450* (DNA); Mac Clarke Reserve, Andado Station, Aug 1992, *Coulson 61 & Latz* (DNA); Mt Wilyunpa, Aug 1992, *Coulson 35* (DNA); Alice Springs, Andado Station, Aug 1997, *Michell 391 & Calliss* (DNA). **South Australia.** Pedirka, Aug 1932, *Ising* (AD 966031149); Minnie Downs, Apr 1924, *Reese 130* (AD); 8 km SSW of homestead, Dulkaninna Station, Dec 1995, *Badman 8796* (AD).

Distribution and habitat: *Euphorbia ferdinandi* var. *saxosiplaniticola* occurs in central Australia from Allittra Tableland, NT southward to near Maree, SA (**Map 16c**). It grows on clay soils on gibber plains or tablelands.

Phenology: Flowers and fruits have been collected in April, August, September and December.

Notes: *Euphorbia ferdinandi* var. *saxosiplaniticola* differs from *E. ferdinandi* var. *ferdinandi* in having narrower and generally longer capsules, 1.8–2.1 mm long by 1.2–1.5 mm wide, ≥1.3 times as long as wide, that are only faintly minutely papillose (versus capsules 1.4–1.9 mm long by 1.3–1.7 mm wide, <1.3 times long as wide, that are distinctly minutely papillose for *E. ferdinandi* var. *ferdinandi*) and longer seeds 1.4–1.6 mm long (versus seeds 1.1–1.3 mm long for *E. ferdinandi* var. *ferdinandi*). *Euphorbia ferdinandi* var. *saxosiplaniticola* differs from *Euphorbia ferdinandi* var. *appendiculata* in lacking glandular appendages.

Etymology: The varietal epithet is from Latin *saxosa*, rocky or stony places, *planities*, flat surface, plain, and *-cola*, dweller or inhabitant, in reference to the gibber plains of Central Australia where this variety has been recorded growing.

17. *Euphorbia fitzroyensis* Halford & W.K.Harris, **species nova** similis *E. drummondii* Boiss. et *E. hassallii* Halford & W.K.Harris a duabus autem superficiebus seminum porcis 6–9 angustis rotundatis transversis (ad vicem porcis 3–6 transversis in *E. drummondii* et porcis 3–5 prominentibus rotundatis transversus irregularisque in *E. hassallii*) necnon ab *E. drummondii* stylis 1/3–1/2 longitudinis bifidis (ad vicem stylis integris vel vix bifidis) et exotesta manifeste crassa in porcis transversis (ad vicem exotesta aequae crassa in superficie seminum) differt. **Typus:** Western Australia. Liveringa Station, near Fitzroy River, 20 April 1985, *T.E.H.Aplin 172 et al.* (holo: PERTH).

Monoecious, annual to 30 cm high, few to many stems arising from rootstock, the whole plant glabrous. **Stems** erect, sparingly to much branched, longitudinally ridged. **Interpetiolar stipules** subulate or narrow-triangular, 0.4–0.8 mm long, deeply bipartite, glabrous; margin entire or lacinate. **Leaves:** petiole 0.3–0.5 mm long, smooth; blade narrow-oblong, 5–9 mm long, 1.5–3.1 mm wide, 2.5–4.2 times longer than wide; adaxial and abaxial surfaces colour unknown, smooth or minutely papillose (visible at 40× mag.); base asymmetric with one side cordate, the other obtuse; margin entire or sparingly minutely toothed distally; apex rounded or obtuse. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.2–1.4 mm long. **Involucre**s turbinate, 0.5–0.8 mm long, 0.4–0.6 mm across; lobes 5, triangular, 0.3–0.4 mm long, margin entire; glands 4, stipitate, cupuliform, with distinct central pit, transverse-oblong in outline, 0.1–0.15 mm long, 0.2–0.4 mm wide, colour unknown; gland appendages inconspicuous, spreading radially, transverse-linear; *c.* 0.05 mm long and 0.35 mm wide, glabrous, colour unknown, margin entire; bracteoles 0.6–0.8 mm long, adnate for 1/4 of their length to involucre, free portion entire subulate glabrous. **Staminate flowers** 2–4 per cyathium; pedicels 0.8–1 mm long; staminal filaments *c.* 0.1 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, spreading or ascending, smooth, glabrous,

each bifid for 1/3–1/2 of their length, the apices clavate or terete. **Capsules** exserted from involucre on pedicels to 2 mm long; broad-elliptic in lateral view, 1.6–1.8 mm long, 1.6–1.7 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** narrow-ovate in outline, 1.2–1.4 mm long, 0.7–0.8 mm tangentially, 0.6–0.7 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces planar or concave; all faces with 6–9 prominent narrow rounded transverse ridges; exotesta of uneven thickness, distinctly thicker on transverse ridges, white or pale brown, microreticulate; endotesta brown or red-brown. **Figs 6, 25R.**

Additional specimens examined: Western Australia. Fitzroy River crossing, S of Derby, May 1991, *Thomson 3475* (NT); Fitzroy River, Aug 1906, *Fitzgerald s.n. 1567* (PERTH); Fitzroy River, Aug 1906, *Fitzgerald* (NSW 521748); Liveringa, Jan 1953, *Broadbent 590* (BM); Geikie Gorge N.P., Jul 1974, *Carr 3803 & Beaglehole 47581* (NSW, PERTH); Gogo Station, Fitzroy Crossing, May 1962, *Royce 7005* (PERTH).

Distribution and habitat: *Euphorbia fitzroyensis* is confined to the vicinity of the Fitzroy River, WA (**Map 17**). It grows on alluvial plains in eucalypt woodland communities on heavy loam to silty clay soils, and in *Triodia* grassland communities on sandy soils.

Phenology: Flowers and fruits have been collected from April to August.

Notes: *Euphorbia fitzroyensis* is similar to *E. drummondii* and *E. hassallii*. It differs from both species by having seed surfaces with 6–9 narrow rounded transverse ridges (versus 3–6 transverse ridges for *E. drummondii*, and 3–5 prominent rounded transverse or irregular ridges for *E. hassallii*). It also differs from *E. drummondii* in having styles bifidly divided for 1/3–1/2 of their length (versus styles entire or scarcely bifid for *E. drummondii*) and exotesta is distinctly thicker on transverse ridges (versus exotesta is of even thickness over seed surface for *E. drummondii*).

The collection (*Royce 7005*) is tentatively placed here. Although its general form, leaf shape, involucre glands and seeds are consistent with *E. fitzroyensis*, it differs in having stems lacking longitudinal ridges.



Fig. 6. *Euphorbia fitzroyensis*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 8$. C. leaf $\times 6$. D. stipules $\times 16$. E. cyathia with female flower $\times 32$. F. capsule with cyathia $\times 16$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A–I from *Aplin 172* (PERTH). Del. W. Smith.

Etymology: The specific epithet refers to the Fitzroy River area in the Kimberley, WA where the species occurs.

18. *Euphorbia flindersica* Halford & W.K.Harris, *J. Adelaide Botanic Gardens* 24: 43–45 (2010). **Type:** South Australia. Mt Gee, 15 September 1973, *R.H.Kuchel* 3169 (holo: AD).

Illustration: Halford & Harris (2010: 44, fig. 1).

Monoecious, herbaceous perennial to 10 cm high, with short-lived stems produced from thick somewhat woody rootstock, the whole plant glabrous. **Stems** prostrate to erect, much branched, smooth or faintly papillose. **Interpetiolar stipules** triangular 0.4–0.6 mm long, deeply bipartite, glabrous; margin entire or laciniate. **Leaves:** petiole 0.2–1.2 mm long, smooth; blade oblong or obovate, 1.3–6.7 mm long, 1–3.8 mm wide, 1.5–1.8 times longer than wide, both surfaces minutely papillose (visible at 40× mag.); adaxial surface mostly green sometimes with reddish tinge on margin; abaxial surface grey; base strongly asymmetric with one side cordate to rounded, the other cuneate to rounded; margins entire or sparsely minutely toothed distally; apex rounded. **Cyathia** solitary at the nodes; peduncles 0.3–0.7 mm long. **Involucres** campanulate or cupuliform, 0.8–1 mm long, 0.6–1.2 mm across; lobes 5, triangular, 0.3–0.4 mm long, margins ciliate; glands 4, shortly stipitate, patelliform, planar or shallowly concave, transverse-oblong to transverse-elliptic, 0.1–0.3 mm long, 0.3–0.5 mm wide, red or yellowish green; gland appendages conspicuous, spreading radially, obdeltoid, 0.3–0.4 mm long, 0.6–0.8 mm wide, pink or red, glabrous, dentate or irregularly lobed; bracteoles 0.5–0.9 mm long, adnate for 1/3 of their length to involucre, free portion divided into few to numerous subulate glabrous segments. **Staminate flowers** 10–15 per cyathium; pedicels 0.7–1 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles c. 0.5 mm long, spreading, smooth, glabrous, each bifid to 1/4–1/3 of their length, apices slender terete. **Capsules** exserted from involucre on pedicel to 2.7 mm long, ovate to broad-ovate in lateral view, 1.5–1.8 mm

long, 1.7–2.2 mm across, shallowly 3-lobate with keels acute, papillose; hypogynous disc entire. **Seeds** ovate in outline, 1.1–1.3 mm long, 0.7–0.8 mm tangentially, 0.6–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces planar or shallowly convex; all faces smooth or with faint irregular ridges; exotesta thin, of even thickness, cream or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta reddish brown. *n* = 11. **Fig. 26A.**

Additional selected specimens examined: South Australia. Gorge Creek of Myrtle Springs, c. 24 km NW of Leigh Creek, Sep 1962, *Lothian* 1077 (AD); Paralana Springs, 125 km NE of Blinman, Aug 1968, *Carrick* 2059 (AD); south branch of Paralana Hot Springs Creek, Aug 1964, *Saddler s.n.* (AD 96532103); Nepouie Springs, Apr 1994, *Bates* 37341 (AD); Grindell Hut, Balcanoona Station, July 1980, *Williams* 11205 (AD); Italowie Creek, Aug 1979, *Conrick* AD100 (AD); Chambers Gorge, near Mt Chambers, c. 60 km ENE of Blinman, Sep 1956, *Eichler* 12559 (AD); Chambers Gorge, c. 80 km ENE of Parachilna, Sep 1973, *Whibley* 3922 (AD); Parachilna Gorge, Aug 1963, *Sharrad* 1404 (AD); upper Bunyeroo Gorge, c. 50 km NNE of Hawker, Oct 1958, *Kraehenbuehl* 14 (AD); The Bunkers, Bunkers Range, Apr 1989, *James* 16 (AD); Arkaroola Sanctuary, Ridge Top road, Oct 1971, *Kuchel* 3039 (AD); western portion [of] Oraparinna N.P., Sep 1971, *Weber* 2710 (AD); Brachina Gorge, Sep 1961, *Symon* 1400 (AD); Moralana Station, road & rail crossing Bunyeroo Creek, Jul 1987, *Symon* 14628 (AD); Arkaba Station, Oct 1925, *Beck s.n.* (AD 96938301).

Distribution and habitat: *Euphorbia flindersica* is restricted to the northern Flinders Ranges, SA, occurring from near Leigh Creek to Hawker (**Map 18**). It grows on sandy clay soils on rocky outcrops or gravelly hill slopes.

Phenology: Flowers and fruits have been collected from April to October.

Notes: *Euphorbia flindersica* is similar to *E. ferdinandi* and *E. papillata* in having papillose capsules and leaves but differs from both in having involucre glands patelliform, planar or shallowly concave (versus cupuliform, with distinct central pit and thickened rim for *E. ferdinandi* and *E. papillata*).

Euphorbia multifaria and *E. verrucitesta* overlap the distributional range of *E. flindersica* and all three species were previously included in *E. drummondii* s.l. in SA (Weber 1986). *Euphorbia flindersica*

differs from these species by its planar or shallowly concave involucre glands, larger and conspicuous gland appendages, 0.3–0.4 mm long, which are dentate or irregularly lobed.

Hassall (1977) proposed the name *E. drummondii* subsp. *blackii* for this taxon but this name was never validly published.

19. *Euphorbia gregoriensis* Halford & W.K.Harris, **species nova** similis *E. schultzei* var. *comanti* (W.Fitzg.) Halford & W.K.Harris in habitu et indumento et forma foliorum et in amplitudine differt autem capsulis angustioribus (1.9–2 mm) longitudine latitudinem aequi leviter 3-lobatis (ad vicem 2–3 mm latis manifeste latioribus quam latioribus profunde 3-lobatis). Similis *E. hassallii* Halford & W.K.Harris in forma capsularum differt autem exotesta inaequaliter crassa semper crassiore in porcis (ad vicem appendicibus <0.1 mm longis aut si longioribus nunc lobatis profunde) paginis foliorum falcato-oblongis 9.8–12 × 4–6 mm <3 plo longioribus quam latioribus (ad vicem paginis foliorum anguste oblongis vel anguste ovatis 8.2–25 × 2–4.8 mm ≥3 plo longioribus quam latis). **Typus:** Northern Territory. Gregory National Park, 14 km NE of Bullita O/S [outstation], 8 February 1986, *B.G.Thomson 1114* (holo: DNA).

Monoecious, annual to 40 cm high, one to few stems arising from base, the whole plant glabrous except for a few scattered hairs on stems proximally. **Stems** erect, sparingly branched, smooth, glabrous or sparsely hairy proximally; hairs spreading, curled or straight, 0.5–1.0 mm long, white. **Interpetiolar stipules** subulate, 0.5–1.3 mm long, bipartite, glabrous; margin entire. **Leaves:** petiole 0.5–0.8 mm long, smooth; blade falcate-oblong, 9.8–12 mm long, 4–6 mm wide, 1.8–2.7 times longer than wide; adaxial and abaxial surfaces green, minutely papillose to glabrous; base asymmetric, cordate; margin serrate at the apex and along one side or sparingly toothed distally; apex rounded or obtuse. **Cyathia** solitary at the nodes, sometimes clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves;

peduncles 0.5–0.7 mm long. **Involucres** campanulate or turbinate, 0.8–1 mm long, 0.7–0.8 mm across; lobes 5, triangular, 0.5–0.6 mm long, margin fimbriate; glands 4, stipitate (c. 0.075 mm long), cupuliform, with distinct central pit, transverse-oblong in outline, c. 0.2 mm long, 0.3–0.4 mm wide, pale green or pink; gland appendages conspicuous, spreading radially, very broad-obovate, 0.1–0.4 mm long, 0.6–0.8 mm wide, pink or white, glabrous, margin entire; bracteoles c. 0.8 mm long, adnate for 1/3–1/2 of their length to involucre, free portion entire, subulate or divided into numerous subulate segments, glabrous. **Staminate flowers** 7–10 per cyathium; pedicels 1–1.1 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.4–0.5 mm long, ascending, smooth, glabrous, each bifid for c. 1/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 2.5 mm long, broad-elliptic in lateral view, 1.9–2 mm long, 1.9–2 mm across, shallowly 3-lobate with keels acute, smooth or minutely papillose, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 1.3–1.5 mm long; 0.8–0.9 mm tangentially, 0.8–0.9 mm radially, tetraquetrous in cross section; dorsal and ventral faces planar, with prominent broad rounded irregular ridges; exotesta of uneven thickness, distinctly thicker on ridges, white or pale brown, microtuberculate, becoming mucilaginous when moistened; endotesta brown or red-brown. **Figs 7, 26B.**

Additional selected specimens examined: Northern Territory. 50 km [c. 80 km] S [of] Bullita O/S [outstation], Gregory N.P., Mar 1991, *Thomson 3453* (DNA, NT); 20 miles [c. 32 km] S [of] Timber Creek Police Station, May 1959, *Chippendale 6050* (DNA, MEL, NSW); Gregory N.P., 8 km NW of Bullita O/S [outstation], Feb 1986, *Thomson 1082* (DNA); Gregory N.P., 3 km S of Bullita O/S [outstation], Feb 1986, *Thomson 963* (DNA); Bullita Station, Gregory N.P., Feb 1986, *Wightman 2591* & *Clark* (DNA); Gregory N.P., Feb 1986, *Thomson 1166* (DNA); Gregory N.P., Bullock Paddock Creek valley, Apr 1996, *O'Neill 24* (DNA); Gregory N.P., Station Hill, Feb 1992, *Cowie 2502* & *Brocklehurst* (DNA); Wickham River, Mar 1992, *Brocklehurst 616* (DNA).

Distribution and habitat: *Euphorbia gregoriensis* is restricted to the hills of the Gregory N.P. and Victoria River Station, NT (**Map 19**). It grows in eucalypt open woodland communities on shallow soils on

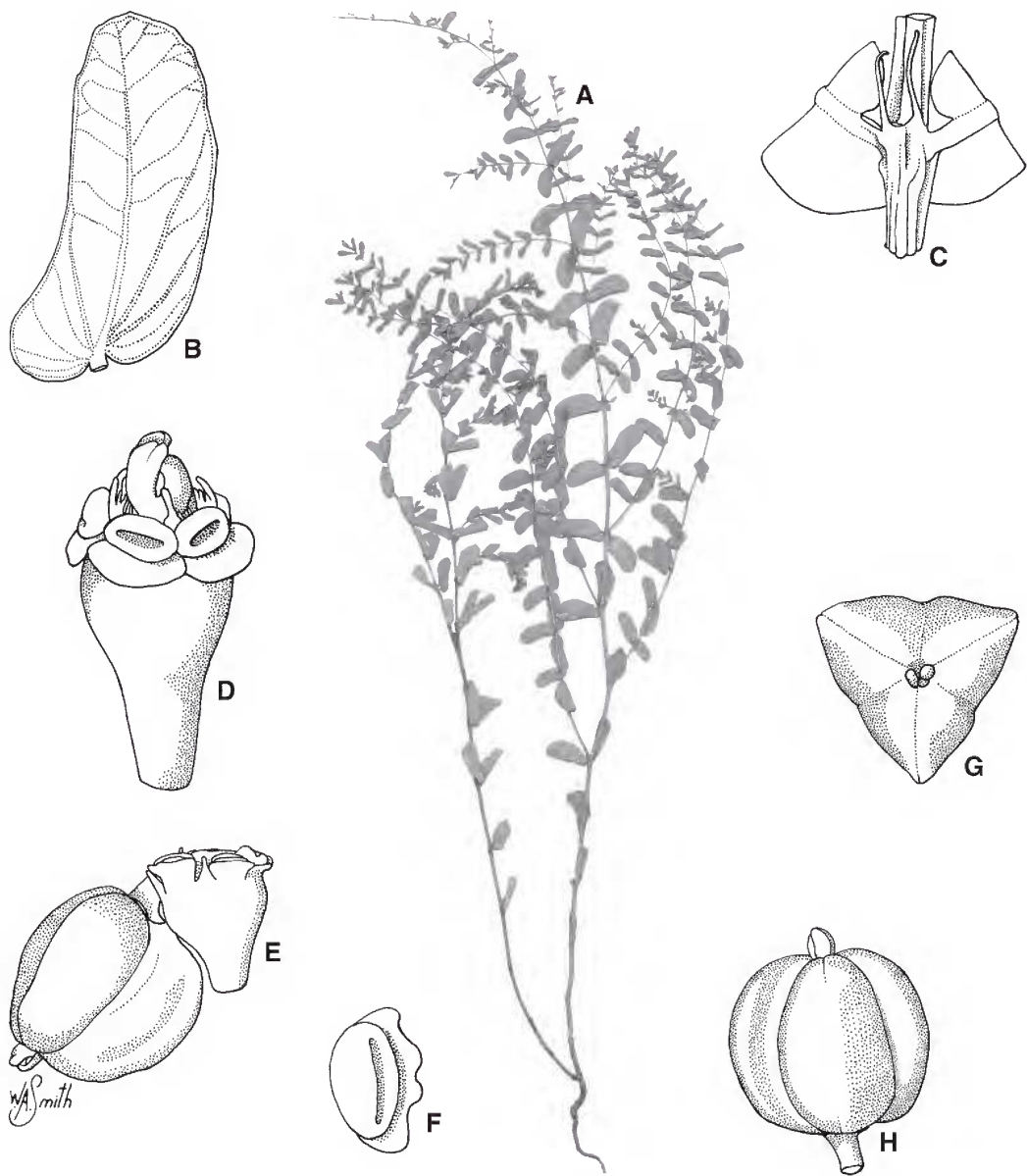


Fig. 7. *Euphorbia gregoriensis*. A. habit $\times 0.4$. B. leaf $\times 4$. C. stipules $\times 12$. D. cyathia with female flower $\times 24$. E. capsule with cyathia $\times 12$. F. cyathial gland with appendage, adaxial view $\times 32$. G. capsule, top view $\times 12$. H. capsule, lateral view $\times 12$. A & B from Thomson 1114 (DNA); C & D from Thomson 1082 (DNA); E–H from Brocklehurst 616 (DNA). Del. W. Smith.

rocky sandstone mesa tops, scree slopes or hill sides.

Phenology: Flowers and fruits have been collected from February to May.

Notes: *Euphorbia gregoriensis* is morphologically similar to *E. schultzei* var. *comans* (W.Fitzg.) Halford & W.K.Harris in habit, indumentum, and leaf shape and size, but differs by having narrower capsules (1.9–2 mm) that are as long as wide and shallowly 3-lobate (versus 2–3 mm across, distinctly broader than long and deeply 3-lobate for *E. schultzei* var. *comans*). *Euphorbia gregoriensis* is similar to *E. hassallii* in capsule shape but differs by having exotesta of uneven thickness, always thicker on ridges (versus exotesta ± of even thickness for *E. hassallii*), gland appendages >0.1 mm long and entire (versus gland appendages <0.1 mm long or if longer then appendages deeply lobed for *E. hassallii*) and leaf blades falcate-oblong, 9.8–12 × 4–6 mm, <3 times as long as wide (versus leaf blades narrow-oblong or narrow-ovate, 8.2–25 × 2–4.8 mm, ≥3 times as long as wide for *E. hassallii*).

The collection *Chippendale 6111* (3.3 miles [c. 5.3 km] E [of] Willeroo, May 1959 [DNA, NSW]) is tentatively referred to here as it most resembles *E. gregoriensis*. However, it is atypical in having a longitudinal band of short crispate hairs along its stems and its seeds lack the thick endotesta that is typical of this species.

Etymology: The specific epithet refers to the Gregory N.P., in the NT where the species occurs.

20. *Euphorbia hassallii* Halford & W.K.Harris, **species nova** similis *E. drummondii* Boiss. sed plerumque stylis longioribus 0.3–0.4 mm longis bifidis usque 1/3 longitudinis apicibus teretibus (ad vicem 0.2–0.3 mm longis integris vel vix bifidis apicibus clavatis) necnon appendicibus glandulae interdum aut carentibus aut leviter usque profunde lobatis (ad vicem appendicibus glandulae semper qui sunt <0.1 mm longis) differt. **Typus:** Northern Territory. Victoria Highway, 30 km W of Katherine, 23 December 1994, *M.J.A. Barritt*

1700 (holo: BRI, iso: DNA, MEL).

Monoecious, annual or herbaceous perennial with slender taproot, to 30 cm high, few stems arising from rootstock. **Stems** erect or ascending (rarely prostrate), sparingly to much branched, smooth, sometimes longitudinally ridged, glabrous or with a sparse indumentum; hairs spreading, ± straight, 0.2–0.4 mm long, white. **Interpetiolar stipules** subulate, 0.5–1.1 mm long, deeply bipartite, glabrous; margin entire. **Leaves:** petiole 0.4–0.6 mm long, smooth, glabrous; blade narrow-oblong or narrow-ovate, 8.2–25 mm long, 2–4.8 mm wide, 3.7–8.8(32) times longer than wide; adaxial surface dark green sometimes with reddish tinge, minutely papillose, glabrous; abaxial surface paler than adaxial surface, minutely papillose, glabrous or with a sparse indumentum; hairs appressed-ascending, straight, 0.2–0.3 mm long; base asymmetric with one side cordate, the other obtuse to cordate; margin entire or sparingly minutely toothed distally; apex rounded, obtuse or acute. **Cyathia** solitary at the upper nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves, peduncles 0.3–0.5 mm long, smooth, glabrous. **Involucres** campanulate or turbinate, 0.6–0.9 mm long, 0.8–1 mm across; lobes 5, triangular, 0.3–0.5 mm long, margin entire or fimbriate; glands 4, stipitate, cupuliform, with distinct central pit and thickened rim, transverse-oblong in outline, 0.1–0.2 mm long, 0.3–0.5 mm wide, red; gland appendages conspicuous or absent, spreading radially, transverse-linear or obdeltoid, to 0.4 mm long, 0.3–0.4 mm wide, pink or red, glabrous, margin shallowly to deeply lobed; bracteoles 0.5–0.9 mm long, free or adnate for up to 1/3 of their length to involucre, free portion entire and subulate or divided into few subulate segments, glabrous. **Staminate** flowers 3–10 per cyathium; pedicels c. 0.8 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.3–0.4 mm long, spreading, smooth, glabrous, each scarcely bifid or bifid for c. 1/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 2 mm long, broad-elliptic in lateral view, 1.5–1.8 mm long, 1.6–1.9 mm across, shallowly 3-lobate

with keels obtuse, smooth or minutely papillose, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 1.1–1.3 mm long, 0.7–0.8 mm tangentially, 0.7–0.8 mm radially, tetraquetrous or tetragonous in cross section; dorsal faces planar or convex; ventral faces planar; all faces with 3–5 prominent rounded transverse or irregular ridges; exotesta thin, of even thickness, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta reddish brown. *n* = 11. **Figs 8, 26C.**

Additional selected specimens examined: **Western Australia.** 1 km E [of] Durack River crossing, Home Valley – Gibb River Road, Mar 1991, *Thomson 3461* (NT); 19 km SE of East Wyndham on Kununurra Road, Jul 1974, *Carr 3224 & Beaglehole 47002* (NSW, PERTH); Bobby Creek, 20.3 km N of turn off to Beagle Bay on Cape Leveque – Broome Road, Apr 1988, *Kenneally 10638* (PERTH); One Arm Point, NE of airstrip, Mar 1996, *Carter BJC708* (BRI, PERTH); NE of airstrip One Arm Point, Apr 1993, *Carter 629* (PERTH); W of Dragon Tree Soak, Great Sandy Desert, Aug 1977, *George 14803* (BRI, PERTH); 80 Mile Beach, near Caravan Park, May 1991, *Thomson 3662* (DNA, NT). **Northern Territory.** Twin Falls, Mar 1982, *Dunlop 6219 & Taylor* (BRI); Mataranka, Elsey N.P., Feb 1994, *Egan 3199* (DNA); Keep River N.P., Apr 1991, *Evans 3760* (BRI); Station Hill, Gregory N.P., Feb 1986, *Wightman 2746 & Clark* (DNA); Gregory N.P., Jasper Creek, Apr 1996, *Booth 1561 & Woodward* (DNA); Limmen Bight River upper reaches, Jan 1989, *Thomson 2859* (DNA); 7 Mile Spring, Gallipoli Station, Jan 1989, *Latz 11226* (DNA). **Queensland.** **COOK DISTRICT:** 60.5 km by road E of Croydon, Gregory River area, Jan 2005, *McDonald KRM3489* (BRI). **BURKE DISTRICT:** Westmoreland Station, just W of Hells Gate, 15 km SE of homestead, May 2005, *Booth 4292 & Thompson* (BRI); 28.5 km SSW of Hells Gate Roadhouse on turnoff Lagoons Station, Apr 2006, *Thompson WES274 & Edginton* (BRI); 54 km NW of Burketown on Escott Station, Apr 2007, *Thompson WES1392 & Wilson* (BRI); 9.1 km by road W of Gilbert River Road crossing towards Croydon, Jan 2005, *McDonald KRM2402* (BRI); Calton Hills Station, N of Mt Isa, May 2004, *Booth 3488 & Kelman* (BRI).

Distribution and habitat: *Euphorbia hassallii* occurs across northern Australia from the Kimberley, WA, through the northern regions of the NT and extending to near Emerald in central Qld (**Map 20**). It grows in eucalypt open forest/woodland, *Acacia* shrubland or tussock grassland communities on sandy to clay soils on plateaux, rocky slopes or plains.

Phenology: Flowers and fruits have been collected from December to July.

Notes: *Euphorbia hassallii* is similar to *E. drummondii* but differs in having generally longer styles (0.3–0.4 mm long) that are bifid for up to a 1/3 of their length, with terete apices (versus 0.2–0.3 mm long, entire or scarcely bifid, with clavate apices for *E. drummondii*). It also differs in generally having longer gland appendages (when present) that are shallowly to deeply lobed (versus gland appendages always present, entire and less than 0.1 mm long for *E. drummondii*) and stems often with a sparse indumentum proximally (versus stems always glabrous for *E. drummondii*).

Euphorbia hassallii is a morphologically variable complex and with further collections and study may be subdivided into a number of taxa. One of the more recognisable variants occurs in the Kimberley, WA. This variant tends to have a prostrate habit, smaller leaves, capsules and seeds, and deeply lobed gland appendages. Representative specimens of this variant are: 15 km N [of] Kalumburu Mission, Apr 1991, *Thomson 3468* (DNA, NT, PERTH); Sir Graham Moore Island, Jul 1973, *Wilson 11252* (PERTH); Durack Range, 90 km WSW of Kununurra, Feb 1993, *Keighery 140 & Gibson* (PERTH); Old Pago Mission, 22 km NNE of Kalumburu, Jun 1990, *Edinger 732* (PERTH).

Etymology: The species is named in honour of Dr David Hassall, botanist and landscape architect, whose studies on the Australian *Euphorbieae* (Hassall 1977) have been of assistance in understanding the complexity of *Euphorbia* in Australia.

21. **Euphorbia hirta* L., *Sp. Pl.* 454. 1753; *Chamaesyce hirta* (L.) Millsp., *Publ. Field Columb. Mus., Bot. Ser.* 2: 303 (1909). **Type: “Habitat in India” (lecto: LINN [*Herb. Linn. No. 630.7*] *n.v.* (image seen) (IDC microfiche 177. 320: II. 5), *fide* Wheeler (1939: 72)).**

Euphorbia pilulifera f. *humifusa* Domin, *Biblioth. Bot.* 89(4): 312 (1927 ‘1926’). **Type:** Queensland. [NORTH KENNEDY DISTRICT:] apud opp. Pentland, February 1910, *K. Domin s.n.* (holo: PR 528327).

Euphorbia pilulifera f. *rubromaculata* Domin, *Biblioth. Bot.* 89(4): 312 (1927 ‘1926’). **Type:** not designated.

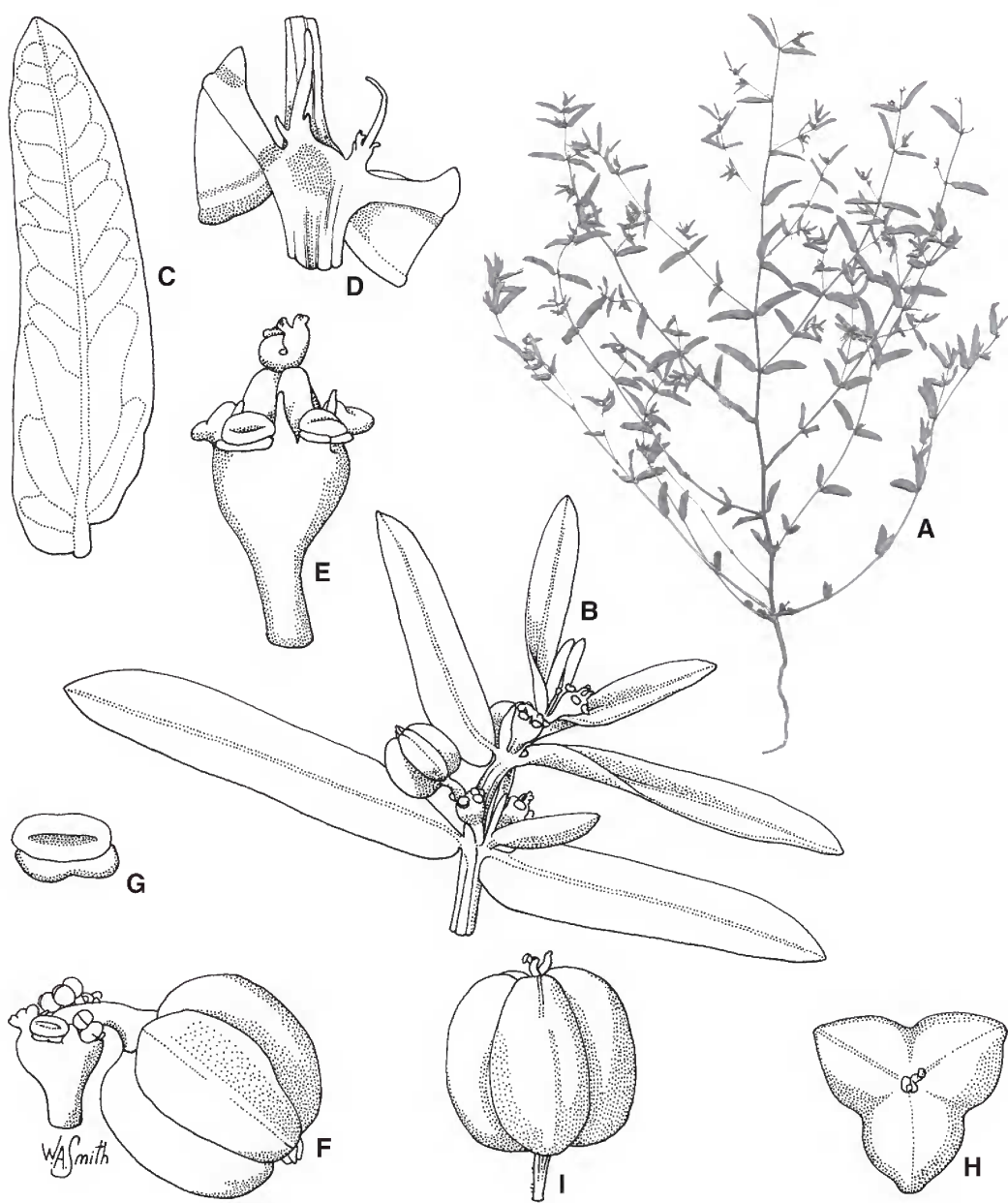


Fig. 8. *Euphorbia hassallii*. A. habit $\times 0.3$. B. branchlet with cyathia $\times 4$. C. leaf $\times 4$. D. stipules $\times 16$. E. cyathia with female flower $\times 24$. F. capsule with cyathia $\times 12$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 12$. I. capsule, lateral view $\times 12$. A–I from *Barritt 1700* (BRI). Del. W.Smith.

Euphorbia pilulifera f. *viridis* Domin, *Biblioth. Bot.* 89(4): 312 (1927 '1926'). **Type:** not designated.

Euphorbia chrysochaeta W.Fitzg., *J. & Proc. Roy. Soc. Western Australia* 2: 162 (1918). **Type:** Western Australia. May River, nr. Emmanuel's Yards, May 1905, *W.V.Fitzgerald* 436 (lecto [here designated]: PERTH *n.v.* (photo at BRI); isoleccto: (NSW 612208).

Illustrations: James & Harden (1990: 429), as *Chamaesyce hirta*; Lin *et al.* (1991: 229, fig. 8), as *Chamaesyce hirta*; Wheeler (1992: figs 183E, 184I, 185I, 186I); Aboriginal Communities of the Northern Territory (1993: 285–286); Dunlop *et al.* (1995: 218, fig. 72); Kleinschmidt *et al.* (1996: 31); Harris (2001: 32, fig. 1), as *Chamaesyce hirta*.

Monoecious, annual to 30 cm high, with one to a few stems arising from the base. Stems ascending to erect, sparingly branched, smooth, sparsely to densely hairy; indumentum consisting of white weakly appressed crispate hairs to 0.5 mm long interspersed with yellow spreading \pm straight segmented hairs to 1.5 mm long. **Interpetiolar stipules** narrow-triangular, 1–1.8 mm long, bifid or deeply bipartite, sparsely hairy abaxially with white ascending hairs 0.2–0.3 mm long; margin lacinate. **Leaves:** petiole 0.5–3 mm long, smooth, with indumentum as for stems; blade ovate or elliptic, 10–50 mm long, 5–21 mm wide, 1.6–2 times longer than wide; adaxial surfaces red or dark green with reddish tinge, smooth, with a sparse indumentum consisting of white \pm appressed curved hairs 0.2–0.4 mm long; abaxial surface pale green often with reddish tinge, smooth, with a sparse to moderately dense indumentum consisting of white \pm appressed crispate or curved hairs up to 1.1 mm long and scattered yellow \pm straight segmented hairs up to 1.5 mm long; base asymmetric with one side rounded, the other cuneate; margin serrulate; apex acute. **Cyathia** in dense (7–160 cyathia) terminal and axillary capitate, cymose clusters to 15 mm in diameter on peduncles 2–17 mm long; bracts subulate to narrow-triangular, to 0.5 mm long; cyathial peduncles 0.2–1.5 mm long. **Involucres** turbinate, 0.5–0.9 mm long, 0.5–0.7 mm across; lobes 5, triangular,

0.2–0.3 mm long, margin lacinate; glands 4, stipitate, cupuliform, concave or with shallow central pit, orbicular in outline, 0.1–0.2 mm long, 0.1–0.2 mm wide, red or purple; gland appendages present and inconspicuous or absent, spreading radially, transverse-oblong or lunate, to 0.15 mm long, 0.1–0.3 mm wide, pink to white, glabrous, margin entire; bracteoles 0.4–0.5 mm long, adnate for *c.* 2/3 of their length to involucre, free portion divided into \pm linear hairy segments. **Staminate flowers** 4–8 per cyathium; pedicels 0.3–0.8 mm long; staminal filaments 0.1–0.3 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, spreading, smooth, glabrous, each bifid for 1/2–2/3 of their length, the apices clavate. **Capsules** exserted from involucre on pedicel to 1.2 mm long, depressed ovate in lateral view, 1–1.4 mm long, 0.9–1.4 mm across, shallowly 3-lobate with keels acute, smooth, pubescent; hairs appressed, *c.* 0.1 mm long; hypogynous disc entire. **Seeds** ovate in outline, 0.7–1 mm long, 0.4–0.5 mm tangentially, 0.4–0.5 mm radially, tetraquetrous in cross section; dorsal and ventral faces planar to concave, with 2–4 faint acute transverse ridges; exotesta very thin, of even thickness, grey-white, microreticulate or micropapillate, becoming mucilaginous when moistened; endotesta pale brown or red-brown. *n* = 9. **Fig. 26D.**

Additional selected specimens examined: **Western Australia.** Kalumburu Mission, Apr 1991, *Willing* 244 (PERTH); Kununurra, Mar 1978, *Aplin* 6247 (PERTH); Chinatown, Broome, Aug 1985, *Kenneally* 9390 (PERTH); Onslow, Feb 1985, *Dodd* 173 & *Madin* (PERTH); Carnarvon, Apr 1969, *Hawson s.n.* (PERTH 2846187). **Northern Territory.** Cobourg Peninsula; Black Point, Apr 1993, *Cowie* 1535 (DNA, MEL); Nabarlek, Oct 1987, *Dunlop* 7147 (DNA, MEL); Bullita Station, Gregory N.P., Feb 1992, *Cowie* 2388 & *Brocklehurst* (DNA); Borroloola townsite, Mar 1979, *Kalotas* 239 (DNA); Docker River town, Mar 1980, *Henshall* 2894 (DNA). **Queensland.** COOK DISTRICT: Unigan N.R., Weipa, Mar 1990, *Forster* PIF6507 & *O'Reilly* (BRI). BURKE DISTRICT: Warang homestead site, White Mountains N.P., 57 km by road N of Torrens Creek, Flinders River catchment, Apr 2000, *Thomas* 1902 & *Thompson* (BRI). LEICHHARDT DISTRICT: Springsure Creek, Springsure, Aug 2004, *Halford* Q8318 (BRI). WIDE BAY DISTRICT: 1.5 km NNE of Didcot, Jan 1996, *Forster* PIF18301 (BRI, MEL). MORETON DISTRICT: Emu Creek, Benarkin S.F., *c.* 11 km SE of Blackbutt, Feb 2003, *Halford* Q7478 (BRI). **New South Wales.** Billinudgel, Middle Pocket Road, Lacks Creek, Apr 2003, *Forster* PIF29321 (BRI); *c.* 2 miles [*c.* 3 km] NW of Coaldale, Jul 1969, *Clark* 1848 *et al.* (NSW); Grafton,

Feb 1946, *Flintoff s.n.* (NSW 931); Whip Mountain, near Macksville, Mar 1981; *Ennis s.n.* (NSW 373094); 30 km from Singleton alongside the Putty Road, Mar 2001, *Hosking 2012* (MEL, NSW).

Distribution and habitat: A native of the New World, now a common pantropical weed. In Australia, the species has become widespread across northern Australia from Carnarvon, WA through the NT to Qld south to Sydney, NSW (**Map 21**). It is a common weed of drainage lines, roadsides, lawns, garden beds and cultivated land.

Phenology: Flowers and fruits have been collected throughout the year, particularly from February to June.

Notes: *Euphorbia hirta* is easily distinguished from the native Australian *Euphorbia* species by its indumentum of long yellowish coloured hairs on stems and petioles. *Euphorbia hirta* is very similar to *E. ophthalmica* Pers., but *E. hirta* has a more robust, erect habit with generally larger leaves and cyathia in axillary as well as terminal cymose glomerules.

22. *Euphorbia hyssopifolia L., *Syst. Nat.* 10th edn, 1048 (1759); *Chamaesyce hyssopifolia* (L.) Small, *Bull. New York Bot. Gard.* 3: 429 (1905). **Type:** Jamaica, *s.d.*, *P. Browne s.n.* (lecto: LINN [*Herb. Linn. No.* 630.9] *n.v.* (image seen) (IDC microfiche 177.320: II. 7), *fide* Fawcett & Rendle [1920: 339]).

Illustrations: Lin *et al.* (1991: 232, fig. 10), as *Chamaesyce hyssopifolia*; James & Harden (1990: 429), as *Chamaesyce nutans*; Carolin & Clarke (1991: 58), as *Euphorbia nutans*; Wilson *et al.* (1995: 109–110).

Monoecious, annual or sometimes herbaceous perennial with slender taproot, to 60 cm high, one or a few stems arising from rootstock. **Stems** ascending, erect (rarely prostrate), sparingly to much branched, smooth, glabrous or sparsely pubescent with hairs in two longitudinal bands; hairs to 0.4 mm long, weakly spreading, crispate, white. **Interpetiolar stipules** broad-triangular, 0.3–0.6 mm long, glabrous; margin lacerate with the teeth often gland-tipped. **Leaves:** petiole 0.5–2 mm long, smooth, glabrous or with indumentum as for stems; blade narrow-ovate or narrow-elliptic (rarely slightly

falcate), 10–30 mm long, 4–11 mm wide, 2.5–5 times longer than wide; adaxial surface green sometimes with irregularly shaped reddish blotches or suffused with reddish tinge, smooth, glabrous or sparsely hairy with spreading, \pm straight hairs to 1 mm long; abaxial surface pale green, smooth; glabrous or sparsely hairy with ascending, \pm straight hairs to 1 mm long; base asymmetric with one side rounded to cordate, the other obtuse; margin serrulate; apex obtuse to rounded. **Cyathia** in lax 2–4 branched dichasial cymes together with a solitary cyathium at the distal nodes; peduncles 10–25 mm long; bracts leaf-like but smaller than primary stem leaves; cyathial peduncles 1–1.5 mm long. **Involucres** turbinate, 0.4–0.9 mm long, 0.8–1.2 mm across; lobes 5, triangular to subulate, 0.1–0.3 mm long, margin lacinate; glands 4, shortly stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, 0.1–0.4 mm long, 0.3–0.6 mm wide, pale green or pink; gland appendages present and conspicuous to inconspicuous, spreading radially, transverse-oblong, transverse-linear or reniform, 0.1–0.4 mm long, 0.3–0.6 mm wide, white or pink, margin entire; bracteoles 0.4–0.6 mm long, adnate for *c.* 2/3 of their length to involucre, free portion deeply divided into \pm linear glabrous or hairy segments. **Staminate flowers** 5–12 per cyathium; pedicels *c.* 1 mm long; staminal filaments 0.1–0.4 mm long. **Pistillate flowers:** styles 0.2–0.4 mm long, erect to ascending, smooth, glabrous, each bifid for *c.* 1/2 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 2 mm long, depressed ovate or transversely broad-elliptic in lateral view, 1.5–2 mm long, 1.5–2 mm across, shallowly to deeply 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** broad-ovate in outline, 0.9–1.2 mm long, 0.5–0.9 mm tangentially, 0.7–0.8 mm radially, tetragonous in cross section; dorsal faces convex; ventral faces planar to convex; all faces with 2–4 prominent \pm transverse acute ridges; exotesta thin, of even thickness over surface, grey-white, micropapillate, becoming mucilaginous when moistened; endotesta pale brown to dark brown. **Fig. 26E.**

Additional selected specimens examined: **Western Australia.** Howatharra, SE of Northampton, 2001, Anon. (PERTH 6096956); Kitchener Street, Victoria Park, Perth, Apr 1997, *Lepschi* 3410 (BRI, PERTH); Quarantine Office, Kewdale, Perth, Apr 2002, *Buckley s.n.* (BRI [AQ558138]). **Northern Territory.** Gove Golf Club, Booth 2158 (DNA); Tennant Creek township, Nov 1996, *Latz* 15020 (DNA); Undoolya Road, Alice Springs, Dec 1991, *Thomson* 3573 (DNA). **Queensland.** BURKE DISTRICT: Normanton, Mar 1999, *Waterhouse* BMW5136 (BRI). NORTH KENNEDY DISTRICT: Townsville Field Training Area (Dotswood sector), Camp McAliney (350 man camp), Apr 2001, *Waterhouse* BMW6195 (BRI); 2 McPheno Street, Charters Towers, Jan 1986, *Bolton* 546 (BRI). LEICHHARDT DISTRICT: Charles Street, Springsure, Aug 2004, *Halford* Q8314 (BRI); 57 km NW of Wandoan, Jan 2003, *Hodgkinson s.n.* (BRI [AQ732941]). PORT CURTIS DISTRICT: Heron Island, Oct 1998, *Batianoff* 981087 (BRI). DARLING DOWNS DISTRICT: 2 km W of Macalister on road to Chinchilla, Feb 2004, *Halford* Q8140 & *Harris* (BRI). MORETON DISTRICT: Chapel Hill Reservoir, Fleming Road, c. 9 km W of Brisbane, Oct 1997, *Bean* 12761 (BRI); Brocks Road, Currumbin Valley, Feb 2004, *Halford* Q8160 & *Edginton* (BRI). **New South Wales.** Clarrie Hall Dam, SW of Murwillumbah, Feb 2000, *Bean* 16009 (BRI); Billinudgel, Middle Pocket Road, Lacks Creek, Apr 2003, *Forster* PIF29322 (BRI); Byron Bay, Nov 1987, *Coveny* 12780 *et al.* (BRI); 30 km from Singleton alongside the Putty Road, Mar 2001, *Hosking* 2013 (MEL, NSW); Wentworth Avenue, East Lakes, Jan 1984, *Coveny* 11772 & *Wilson* (NSW). **Australian Capital Territory.** Majura Avenue at junction with Officer Crescent, Dickson, Canberra, Feb 2006, *Lepschi* 5432 & *Mallinson* (BRI).

Distribution and habitat: *Euphorbia hyssopifolia* is native to the tropic and subtropic regions of the Americas, now naturalised in tropical Africa, Asia and Australia. In Australia, the species is recorded in all mainland Australian States except Vic and SA (**Map 22**). The species frequently colonises sunny open positions, on sandy beaches, road verges, garden beds or disturbed ground.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia hyssopifolia* is recognised by having usually ascending to erect stems, broad-triangular interpetiolar stipules 0.3–0.6 mm long with lacerate margins and the teeth often gland-tipped, glabrous capsules and seeds surfaces with 2–4 prominent acute ± transverse ridges.

Collections from NSW here identified as *E. hyssopifolia* have been previously named

Chamaesyce nutans (Lag.) Small (James & Harden 1990). *Euphorbia hyssopifolia* and *E. nutans* Lag. are native to North America and considered closely related. The main differences between the two species appear to be in seed sculpturing (seeds surfaces transversely ridged for *E. hyssopifolia* versus wrinkled for *E. nutans*), capsule size (1.5–2.1 mm long for *E. hyssopifolia* versus 1.9–2.3 mm long for *E. nutans*) (Burch 1966; Elmore & McDaniel 1986).

23. *Euphorbia inappendiculata* Domin, *Biblioth. Bot.* 89(4): 309 (1927 '1926'); *Chamaesyce inappendiculata* (Domin) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Western Australia.] between the Ashurton and the De Gray Rivers, *s.d.*, *E. Clement s.n.* (lecto [here designated]: PR 528295; isolecto: PR 528293).

Monoecious, annual or herbaceous perennial to 30 cm high, few to many stems arising from slender or thickened woody taproot. **Stems** prostrate, decumbent or ascending to erect, sparingly to much branched, glabrous or sparsely pilose with spreading, straight or curved white hairs 0.5–0.9 mm long, smooth. **Interpetiolar stipules** subulate, 1–1.8 mm long, bipartite, glabrous; margin entire, lacinate or irregularly toothed distally. **Leaves:** petiole 0.3–8 mm long, smooth, glabrous; blade narrow-oblong to oblong, oblanceolate, obovate, oblong-obovate or elliptic, 3–14 mm long, 1.5–6.5 mm wide, 1.5–4(4.7) times longer than wide; both surfaces green sometimes suffused with red pigmentation, smooth or minutely papillose; adaxial surface glabrous; abaxial surface glabrous or sparsely hairy with spreading, straight to curved hairs to 0.8 mm long; base asymmetric with one side cordate or rounded, the other cuneate or obtuse; margin entire or sparingly minutely toothed distally; apex obtuse to rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.1–0.8 mm long, smooth, glabrous. **Involucre**s turbinate, campanulate or cupuliform, 0.4–0.8 mm long, 0.5–0.7 mm across; lobes 5, triangular or subulate, 0.1–0.5

mm long, margin entire, laciniate or sparsely ciliate; glands 4, stipitate, patelliform, concave with tangential trough or cupuliform with shallow central pit and sometimes with thickened margin, transverse-oblong or \pm orbicular in outline, 0.05–0.15 mm long, 0.1–0.2 mm wide, pink or red; appendages conspicuous or absent, spreading radially, transverse-linear, 0.07–0.3 mm long, 0.2–0.4 mm wide, white, glabrous, margin entire or shallowly lobed; bracteoles 0.4–0.6 mm long, adnate for c. 1/6 of their length to involucre, free portion entire or divided into a few subulate segments, glabrous. **Staminate flowers** 3–5 per cyathium; pedicels 0.6–1 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.2–0.5 mm long, spreading to ascending, smooth, glabrous, each bifid for 1/3–2/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 1.5 mm long, elliptic to transversely broad-elliptic (rarely very broad-ovate) in lateral view, 1.3–1.6 mm long, 1.2–1.8 mm across, shallowly 3-lobate with keels acute or obtuse, smooth or minutely papillose (visible at 40 \times mag.), glabrous; hypogynous disc entire. **Seeds** ovate in outline, 0.9–1.3 mm long, 0.5–0.8 mm tangentially, 0.5–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar, concave or convex; ventral faces planar or concave; all surfaces smooth or with faint narrow rounded irregular or transverse ridges; exotesta thin, of even thickness over

surface, white or grey-white, microreticulate, non mucilaginous or becoming mucilaginous when moistened; endotesta pale brown to brown.

Distribution and habitat: *Euphorbia inappendiculata* is widespread in arid Australia from the Pilbara, WA through central NT to north-eastern SA and into central Qld and western NSW.

Notes: *Euphorbia inappendiculata* is similar to *E. drummondii* but differs in having longer subulate stipules (1–1.8 mm long versus 0.5–0.9 mm long for *E. drummondii*), generally smaller glands, 0.1–0.15 \times 0.1–0.2 mm (versus 0.15–0.2 \times 0.2–0.4 mm for *E. drummondii*) that are patelliform, and planar to shallowly concave (versus glands cupuliform, with a distinct central pit and thickened rim for *E. drummondii*), and seeds surfaces smooth or with faint narrow rounded irregular or transverse ridges (versus seeds surfaces with 3–6 distinct transverse ridges for *E. drummondii*).

Euphorbia inappendiculata exhibits some discontinuous variation in indumentum and gland appendage characters with some geographical discontinuity. This variation is considered sufficient to warrant formal recognition of three varieties within this species which can be distinguished using the following key.

Key to varieties of *Euphorbia inappendiculata*

- 1 Stems pilose; surface of seeds \pm smooth or faintly undulate; exotesta not becoming mucilaginous when moistened **23a. *E. inappendiculata* var. *inappendiculata***
1. Stems glabrous; surface of seeds with faint narrow rounded irregular or transverse ridges; exotesta becoming mucilaginous when moistened **2**
- 2 Gland appendages <0.1 mm long or absent; seeds 1.1–1.3 mm long; leaf blades 7–9 \times 2.2–4 mm **23b. *E. inappendiculata* var. *queenslandica***
2. Gland appendages 0.1–0.3 mm long; seeds 1–1.1 mm long; leaf blades 6–13 \times 3.2–6.2 mm **23c. *E. inappendiculata* var. *robustior***

23a. *Euphorbia inappendiculata* var. *inappendiculata*

Annuals or herbaceous perennials. **Stems** prostrate, sparsely pilose with spreading, straight or curved white hairs 0.5–0.9 mm long. **Leaves:** petiole 0.3–0.7 mm long; blade oblong, elliptic or oblong-obovate, 3–9 mm long, 1.5–5 mm wide, 1.5–2 times longer than wide; adaxial surface glabrous; abaxial surface glabrous, or with sparse spreading trichomes that are straight to curved, to 0.8 mm long. **Invulcres** campanulate or cupuliform, 0.7–0.8 mm long, 0.5–0.6 mm across; glands, patelliform, concave with tangential trough, transverse-oblong in outline, c. 0.15 mm long, 0.1–0.2 mm wide; appendages transverse-linear, <0.1 mm long or absent. **Seeds** 0.9–1.1 mm long, 0.5–0.6 mm tangentially, 0.5–0.6 mm radially, tetraquetrous in cross section; facets smooth or faintly undulate. **Fig. 26F.**

Additional selected specimens examined: **Western Australia.** 10 km W [of] Fortesque River bridge, Panawonica Railway, May 1991, *Thomson 3503* (NT, PERTH); 5 km N [of] Fortesque River crossing, Panawonica/Millstream Road, May 1991, *Thomson 3505* (NT); Two Mile Creek, Warralong Station, May 1941, *Burbidge 762* (PERTH); Barlee Range N.R., 10.8 km W of Mt Palgrave, 7.8 km NE of Mt Maitland, 11.3 km ESE of Mt Padbury, Barlee Range, Aug 1993, *van Leeuwen 1437* (PERTH).

Distribution and habitat: *Euphorbia inappendiculata* var. *inappendiculata* is restricted to the Pilbara, WA, occurring from Barlee Range to Warralong Station (**Map 23a**). It is recorded as growing on heavy clay soils on open plains or gentle slopes.

Phenology: Flowers and fruits have been collected in May and August.

Typification: Domin (1927) based his description of *E. inappendiculata* on material collected by Clement from “Nordwest-Australien: zwischen Ashburton – und De Gray River”. Two sheets of a collection made by Clement from between the Ashurton and the De Gray Rivers, WA have been located amongst material on loan to BRI from PR and are numbered PR 528295 and PR 528293 respectively. The sheet PR 528295 is here selected as lectotype of *E. inappendiculata* because it is part of the original material, has morphology that matches the description in

the protologue, and is the best preserved and more ample of the two specimens.

23b. *Euphorbia inappendiculata* var. *queenslandica* Domin, *Biblioth. Bot.* 89(4): 309 (1927 ‘1926’). **Type: Queensland. [BURKE DISTRICT:] apud opp. Hughenden et Cloncurry, February 1910, *K. Domin s.n.* (holo: PR 528294).**

Chamaesyce sp. B.; James & Harden (1990: 428).

Euphorbia “Marree” (F.J. Badman 776); Barker (1993: 50).

Chamaesyce sp. Marree (F.J. Badman 776); Barker (2005: 84).

Annuals to 15 cm high, whole plant glabrous. **Stems** prostrate, decumbent or ascending to erect. **Leaves:** petiole 0.3–0.6 mm long; blade narrow-oblong, oblanceolate or obovate, 7–9(14) mm long, 2.2–4 mm wide, 2.2–4(4.7) times longer than wide; adaxial and abaxial surfaces glabrous. **Invulcres** turbinate, 0.5–0.6 mm long, 0.5–0.6 mm across; glands cupuliform, often poorly formed with shallow central pit and sometimes with thickened margin, ± orbicular in outline, to 0.1 mm long, 0.1–0.2 mm wide; appendages transverse-linear, <0.1 mm long or absent. **Seeds** 1.1–1.3 mm long, 0.5–0.7 mm tangentially, 0.5–0.7 mm radially, tetraquetrous in cross section; facets with faint narrow rounded irregular ridges. *n* = 11. **Figs 9, 26G.**

Additional selected specimens examined: **Western Australia.** Calico Creek, 25 km W of Nicholson Station, May 1973, *Aplin 5326* (PERTH); 1.1 km S of Mt Brockman, 22 km W of Hamersley Station homestead, Sep 2006, *Halford Q9262* (BRI). **Northern Territory.** Victoria River Crossing, between Top Springs & Timber Creek, Jul 1974, *Carr 2751* & *Beaglehole 46530* (MEL, NSW); Boree Creek, 6 m [iles] [c. 10 km] N [of] No. 48 bore, Brunette Downs, Apr 1970, *Latz 576* (AD, DNA); 24 km SW [of] Delmore Downs homestead, Jul 2000, *Albrecht 9255* (NT); 5 km SW [of] Alcoota Station homestead, Jul 2000, *Albrecht 9209* & *Latz* (NT); Alice Springs Shooting complex claypan (Conlans Lagoon), Feb 2007, *Albrecht 12101* & *Duguid* (BRI); 15 km N [of] Mt Dare homestead, Andado Station, Apr 1997, *Latz 15192* (DNA, NT). **Queensland.** BURKE DISTRICT: ‘Lydia Downs’ c. 45 miles [c. 72 km] NW of Maxwellton, Jan 1966, *Pedley 1958* (BRI). MITCHELL DISTRICT: 36.9 km SE of Winton on Longreach Road, Sep 1984, *Chinnock 6109* (AD); c. 55 miles [c. 88 km] NW of Longreach, Jul 1974, *Hassall 7438* (BRI). GREGORY NORTH DISTRICT:

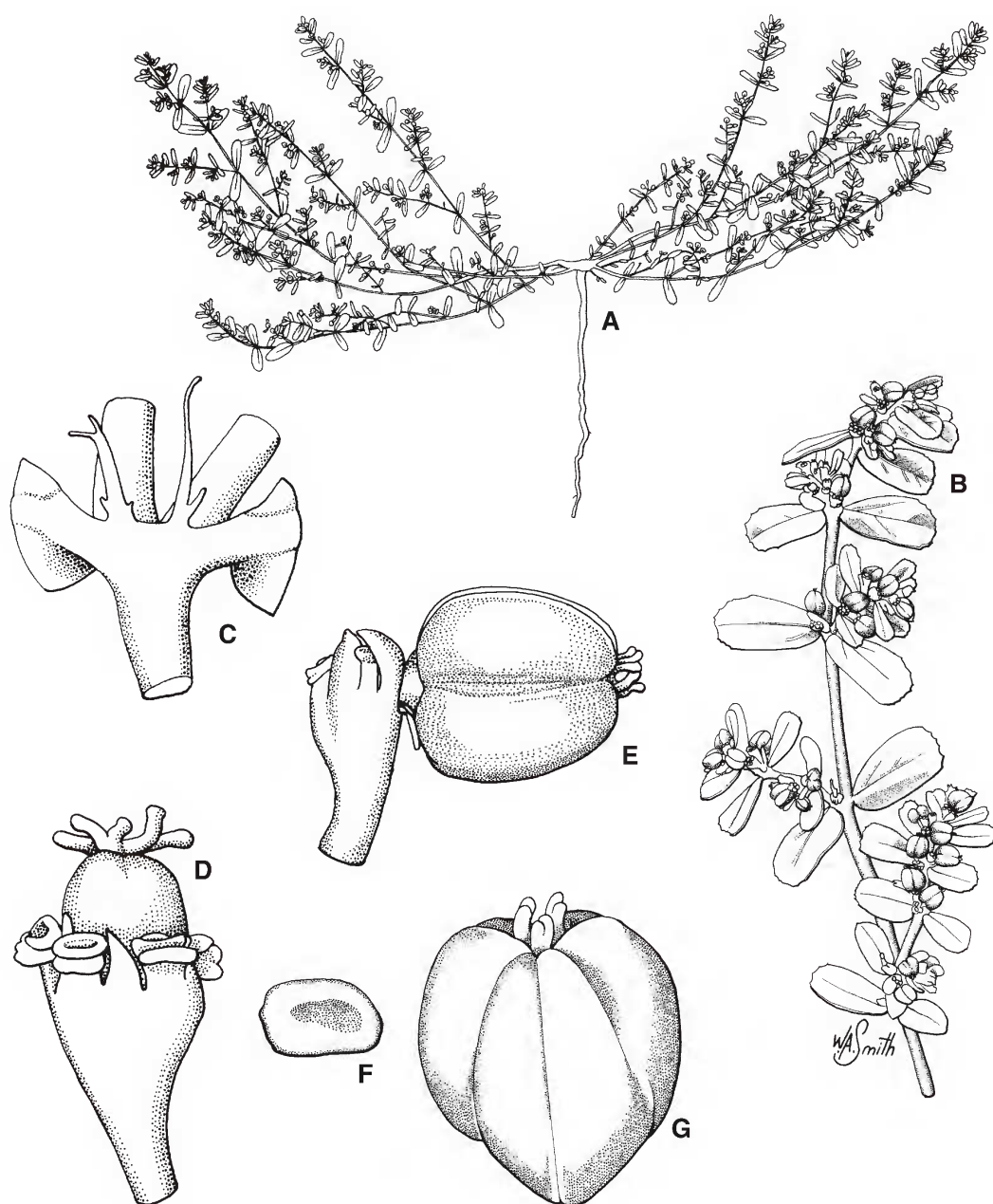


Fig. 9. *Euphorbia inappendiculata* var. *queenslandica*. A. habit $\times 0.5$. B. branchlet with cyathia $\times 2$. C. stipules $\times 16$. D. cyathia with female flower $\times 32$. E. capsule with cyathia $\times 16$. F. cyathial gland, adaxial view $\times 48$. G. capsule, oblique view $\times 24$. All from Halford 8128 (BRI). Del. W. Smith.

Long Hole, Winton Water Supply, Mar 1998, *Forster PIF22313* & *Booth* (BRI). WARREGO DISTRICT: 14 km E of Cunnamulla on road to St George, Feb 2004, *Halford Q8128* & *Harris* (BRI). **South Australia.** Site 4W, Coongie Lakes Survey, Feb 1988, *Gillen 1211* (AD); Peake Creek, on the William Creek – Oodnadatta Road, Feb 1983, *Weber 8947* (AD); Frome Downs Station, Apr 1968, *Barker 444* (AD). **New South Wales.** Walkdens Plain, Bourke, Mar 1974, *Milthorpe* & *2179 Cunningham* (NSW); ‘Glen Hope’, Ingleby paddock, c. 10 km N of White Cliffs, Apr 1976, *Lawrie 1893* (NSW); 16 km S of Bourke on edge of Cobar Road, Mar 1973, *Keane 6* (NSW); Fowlers Gap Research Station, Broken Hill, Mar 1968, *Young MCB15023* (NSW); Pooncarie site Poo031, 4 km S of ‘Melton Grove’ on the Darnick Road (just N of Willandra Creek), May 1994, *Porteners 9405015* & *Benson* (NSW).

Distribution and habitat: *Euphorbia inappendiculata* var. *queenslandica* is widespread in arid and semi-arid eastern Australia, extending from central NT and north-eastern SA into central Qld and western NSW, with disjunct occurrences in the Hamersley Range and near the Nicholson River, WA, and Victoria River, north-western NT (**Map 23b**). It grows in *Astrebla* spp. grassland, *Acacia cambagei* low woodland, or grassland/chenopod shrubland communities on cracking clay soils on plains or gently undulating terrain.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia inappendiculata* var. *queenslandica* differs from *E. inappendiculata* var. *inappendiculata* in having glabrous stems, seed surface with faint narrow rounded irregular ridges, and exotesta that becomes mucilaginous when moistened. For features distinguishing *E. inappendiculata* var. *queenslandica* from *E. inappendiculata* var. *robustior*, refer to the ‘Notes’ section under that variety.

23c. *Euphorbia inappendiculata* var. *robustior* Halford & W.K.Harris, **varietas nova** a varietatis aliis *E. inappendiculatae* Domin plerumque caulibus robustioribus appendicibus glandulae majoribus 0.1–0.3 mm longis (ad vicem <0.1 mm in *E. inappendiculata* var. *inappendiculata* et var. *queenslandica* Domin) necnon ab *E. inappendiculata* var. *inappendiculata* caulibus glabris necnon *E. inappendiculata*

var. *queenslandica* seminibus brevioribus 1–1.1 mm longis (ad vicem 1.1–1.3 mm longis) differt. **Typus:** Northern Territory. 6 miles [c. 10 km] east [of] No. 7 bore near Elliott, 19 February 1969, *P.K.Latz 435* (holo: DNA, iso: BRI; according to label information on the holotype sheet there are duplicates (isotypes) lodged at K *n.v.*, MO *n.v.*).

Annuals or herbaceous perennials to 30 cm high, whole plant glabrous. **Stems** mostly prostrate or rarely ascending. **Leaves:** petiole 0.8–2 mm long; blade oblong, obovate, or oblong-obovate, 6–13.2 mm long, 3.2–6.2 mm wide; 1.8–3 times longer than wide; adaxial and abaxial surfaces glabrous. **Involucres** turbinate, 0.4–0.7 mm long, 0.5–0.7 mm across; glands cupuliform, often poorly formed, concave, orbicular in outline, to 0.1 mm long, 0.1–0.2 mm wide; appendages oblong, 0.1–0.3 mm long, 0.2–0.4 mm wide. **Seeds** 1–1.1 mm long, 0.6–0.8 mm tangentially, 0.6–0.8 mm radially, tetraquetrous or tetragonous in cross section; facets with faint narrow rounded irregular or transverse ridges. **Fig. 26H.**

Additional selected specimens examined: Northern Territory. Stuart Highway at Newcastle Creek, Mar 1979, *Kalotas 225* (DNA); 7 km E of No. 7 Bore, Newcastle Waters Station, Mar 1979, *Kalotas 208, 210* (DNA); 36 km SW [of] Ucharonidge homestead, Feb 1989, *Thomson 3235* (DNA); 5 km SW [of] No. 9 Bore, Brunchilly Station, Jun 1984, *Low 127* (DNA); 30 miles [c. 48 km] NW of Rockhampton Downs Station, Jul 1948, *Perry 1588* (DNA); Alexandria Station, 15 km NW of homestead, Mar 1981, *Henshall 3519* (DNA); 10 km NNE of Connells Bore (Pictorella Swamp), May 1982, *Latz 9139* (DNA); Connells Lagoon, Sep 1986, *Piercey s.n.* (DNA [A0088677], NT 88677). **Queensland.** BURKE DISTRICT: c. 40 km NW of Burke and Wills Roadhouse along Wills Developmental Road (160 km SSE of Burketown), 1995, *Kemp 890* & *Fairfax* (BRI); 25 km E of Richmond, May 1974, *Byrnes 3017* (BRI).

Distribution and habitat: *Euphorbia inappendiculata* var. *robustior* occurs from Newcastle Waters, NT, east to Richmond, north-western Qld (**Map 23c**). It grows in mostly *Astrebla* spp. grassland or chenopod shrubland communities on clay loam to cracking clay soils on plains or floodouts.

Phenology: Flowers and fruits have been collected from February to September.

Notes: *Euphorbia inappendiculata* var. *robustior* differs from the other varieties of *E. inappendiculata* by its generally more robust stems and larger gland appendages (0.1–0.3 mm long versus <0.1 mm long for *E. inappendiculata* var. *inappendiculata* and *E. inappendiculata* var. *queenslandica*). It also differs from *E. inappendiculata* var. *inappendiculata* in having glabrous stems). It differs from *E. inappendiculata* var. *queenslandica* in having shorter seeds (1–1.1 mm long versus 1.1–1.3 mm long for *E. inappendiculata* var. *queenslandica*).

Etymology: The varietal epithet is from Latin *robustus*, robust, and the comparative suffix; *-ior* more so, to a greater degree, in reference to the more robust habit of this variety when compared with the other varieties of this species.

24. *Euphorbia kimberleyensis* B.G.Thomson, *Nuytsia* 8: 358, fig. 4 (1992).

Type: Western Australia. Palm Woodland, Mitchell Plateau, West Kimberley, 15 June 1976, K.F.Kenneally 4921 (holo: PERTH; iso: CANB *n.v.*, *fide* Thomson [1992: 358]).

Illustrations: Wheeler (1992: figs 184Q, 185Q, 186Q), as *Euphorbia* sp. A; Thomson (1992: 359, fig. 4).

Monoecious, annual to 20 cm high, few to many stems arising from fibrous roots. **Stems** mostly prostrate or occasionally decumbent to ascending, much branched, moderately densely hairy on one side, smooth; hairs ascending-spreading, curved (retrorse) or occasionally straight, to 1 mm long, white.

Interpetiolar stipules subulate to triangular, 0.8–1.9 mm long, entire or bipartite, glabrous; margin \pm entire or lacinate. **Leaves:** petiole 0.6–2 mm long, smooth, glabrous; blade ovate to broad-ovate, occasionally slightly falcate, 9–27 mm long, 6–16 mm wide, 1.2–1.8 times longer than wide; adaxial surface green developing purplish tinge with age; abaxial surface pale green; both surfaces smooth, glabrous; base asymmetric with one side cordate, the other obtuse to rounded; margin entire or sparingly minutely toothed; apex obtuse to rounded sometimes with short acuminate or apiculate tip. **Cyathia** solitary at the nodes, sometimes clustered on short leafy

lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 1–4 mm long, smooth, glabrous. **Involucres** turbinate, 1.5–2 mm long, 1.5–2.5 mm across; lobes 5, triangular, 0.6–1.1 mm long, margin entire; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, 0.5–0.7 mm long, 0.8–1.5 mm wide, red; gland appendages conspicuous, spreading radially, \pm obdeltoid, (0.5)1.3–2.5 mm long, 1.2–2.5 mm wide, pink to white, glabrous, margin dentate to lacinate; bracteoles 1.4–1.9 mm long, adnate for *c.* 1/2 of their length to involucre, free portion divided into numerous subulate plumose segments. **Staminate flowers** 19–32 per cyathium; pedicels 1.9–2.1 mm long; staminal filaments 0.4–0.8 mm long. **Pistillate flowers:** styles 0.7–1.5 mm long, erect with spreading apices, smooth, glabrous, entire, the apices terete. **Capsules** exserted from involucre on pedicel to 5 mm long, broad to very broad-ovate or broad-elliptic in lateral view, 3.5–4 mm long, 3.8–4 mm across, shallowly 3-lobate with keels acute, papillose, glabrous or rarely sparsely hairy with hairs confined to keels, spreading, to 1.5 mm long; hypogynous disc entire. **Seeds** ovate in outline, 2–2.8 mm long, 1.5–1.8 mm tangentially, 1.5–1.8 mm radially, tetraquetrous in cross section; dorsal faces \pm planar; ventral faces planar or slightly concave; all surfaces with low rounded irregular ridges; exotesta of uneven thickness over surface, distinctly thicker on the ridges, pale brown, microreticulate, becoming mucilaginous when moistened; endotesta dark brown. **Fig. 261.**

Additional selected specimens examined: Western Australia. Port Warrender area, Apr 1988, *Dunlop 7881* (DNA); area of Carson Volcanics towards Port Warrender off the laterite plateau, May 1978, *Kenneally 6704* (PERTH); eastern margin of Mitchell Plateau, Apr 1991, *Willing 326* (PERTH); near Lone Dingo VT, 9 km SW of Warrender Hill, Jun 1987, *Alford 551* (PERTH); 5 km N [of] Theda homestead, Apr 1991, *Thomson 3466* (AD); Kalumburu road, 108.9 km by road N of junction with Gibb River and Ellenbrae Road, Apr 1985, *Aplin 721 et al.* (PERTH); Silver Gull Creek at spring, *c.* 14 km SE of Cockatoo Island, Apr 1983, *Fryxell & Craven 3868* (PERTH); Gibbings Island, Buccaneer Archipelago, Jun 1982, *Kenneally 8443* (PERTH); Warren Arms fishing camp, Coppermine Creek, Buccaneer Archipelago, Apr 1997, *Brockway CB136* (PERTH); Koolan Island, Jun 1985, *Fryxell 4582 et al.* (PERTH); garden behind house, Warren Arms Camp, Apr 1992, *Mitchell 2252*

(PERTH); Crocodile Creek, 5 km E of W end of Koolan Island, May 1986, *Kenneally* 9719 (PERTH); Milliwindi track opposite Bold Bluff, Apr 1988, *Cranfield* 6382 (PERTH); 5 km N [of] King Leopold Ranges, Apr 1991, *Thomson* 3469 (AD, BRI).

Distribution and habitat: *Euphorbia kimberleyensis* is restricted to the Kimberley, WA, occurring from the Buccaneer Archipelago, east to the King Leopold Range and north east to the Port Warrender and near Kalumburu (**Map 24**). It grows in eucalypt open woodland or *Triodia* grassland communities in rocky sites along creeklines or on hillsides. The soils are recorded as loam or red clay. The geological substrate may be sandstone, laterite or basalt.

Phenology: Flowers and fruits have been collected from April to June.

Notes: *Euphorbia kimberleyensis* seems most closely related to *E. schizolepis*. It differs by its glabrous leaves, cyathia and gland appendages, stems glabrous or with longitudinal bands of hairs, capsules glabrous or rarely with a few hairs along the keels (versus leaves, cyathia, gland appendages, capsules and stems densely hairy for *E. schizolepis*) and fewer staminate flowers per cyathium (15–25 per cyathium versus 30–40 per cyathium for *E. schizolepis*).

25. *Euphorbia laciniloba* Halford & W.K.Harris, **species nova** similis *E. petalae* Ewart & L.R.Kerr et *E. ophioliticae* (P.L.Forst.) Y.Yang sed ab *E. petalae* stylis 1/3–1/2 longitudinis bifidis (ad vicem stylis integris vel vix bifidis), appendicibus glandulae profunde laciniatis lobis acutis usque attenuatis (ad vicem dentatis vel breviter lobatis rotundatis obtusisve), crescentibus plerumque in solo argillaceo (ad vicem crescentibus in solo arenario necnon seminibus minoribus 1.1–1.6 × 0.7–1 × 0.7–1 mm (ad vicem seminibus 1.7–1.8 × 1–1.1 × 1–1.1 mm), foliis oblongis usque oblongo-ellipticis vel ovatis 1.6–2.8 plo longioribus quam latoribus (ad vicem ellipticis usque lato-ellipticis 1–1.5 plo longioribus quam latoribus) differt. **Typus:** Queensland. PORT CURTIS DISTRICT: Marlborough Creek crossing, 3.4 km W of Marlborough on road to Sarina, 28 November 2004, *D.Halford* Q8783 & *G.Batianoff* (holo: BRI, iso: MICH).

Monoecious, herbaceous perennial to 10 cm high, many annual stems arising from woody taproot. **Stems** prostrate or weakly ascending, much branched, longitudinally ridged, glabrous or rarely sparsely hairy; hairs spreading, straight to 0.15 mm long, white. **Interpetiolar stipules** narrowly to broadly triangular, 0.2–0.9 mm long, entire or deeply bipartite, glabrous; margin laciniate. **Leaves:** petiole 0.4–0.9 mm long, smooth, glabrous; blade oblong or oblong-elliptic, 4.3–10.5 mm long, 2.2–5 mm wide, 1.6–2.2 times longer than wide; both surfaces minutely papillose (visible at 40× mag.), glabrous; adaxial surface mainly blue-green with red along the margins; abaxial surface similar to but paler than adaxial surface; base asymmetric with one side shallowly cordate, the other cuneate or obtuse; margin serrulate; apex rounded. **Cyathia** solitary at the nodes; peduncles 1.3–2 mm long, smooth, glabrous, or with a few isolated hairs to 0.1 mm long. **Involucres** campanulate, 0.8–1.1 mm long, 0.8–1.5 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin fimbriate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, 0.2–0.4 mm long, 0.5–1 mm wide, yellowish green or red; gland appendages conspicuous, spreading radially, obdeltoid or oblong, 0.4–1 mm long, 0.8–1.5 mm wide, white or pink, glabrous, margin laciniate; bracteoles 0.7–1 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into numerous subulate hirsute segments. **Staminate flowers** (5) 10–17 per cyathium; pedicels 1–1.2 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, spreading, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3 mm long, depressed ovate in lateral view, 1.6–1.7 mm long, 2–2.1 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, (0.9) 1.1–1.4 mm long, (0.7) 0.8–0.9 mm tangentially, 0.7–0.9 mm radially, tetraquetrous or tetragonous in cross section; dorsal faces planar or convex; ventral faces planar or concave; all surfaces with faint narrow rounded transverse or irregular ridges; exotesta thin, of even thickness

over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta brown. **Figs 10, 26J.**

Additional selected specimens examined: Queensland. LEICHHARDT DISTRICT: 35 km NE of Capella, Mar 1995, *Fensham 2784* (BRI); Warren State Farm, Mar 1920, *Francis s.n.* (BRI [AQ202944]); 35 km SE of Springsure, Jan 1996, *Fensham 2387* (BRI); Palmgrove N.P., NW of Taroom, Bigge Range, Nov 1998, *Forster PIF23707 & Booth* (BRI). PORT CURTIS DISTRICT: Marlborough area, Gap Creek Road, Spring Creek, Oct 2001, *Batianoff 01102GNB et al.* (BRI); near Koolkoorum Creek, S.F. 121, Daves Range, Feb 1994, *Thompson CAL150 et al.* (BRI). BURNETT DISTRICT: Kingaroy, Apr 1947, *Smith 3051* (BRI). MARANO DISTRICT: N of Mt Rugged, Mt Moffatt N.P., Dec 1997, *Bean 12876* (BRI).

Distribution and habitat: *Euphorbia laciniloba* is restricted to central-east and south-east Qld, from Marlborough south to the Bunya Mountains and west to the Carnarvon Range (**Map 25**). It grows in eucalypt woodland or *Poa* grassland communities on alluvial flats, hills or plains. The soils are loam to clays, rarely sand, mostly derived from basalt substrates, rarely from sandstone or mudstone.

Phenology: Flowers and fruits have been collected from October to July.

Notes: *Euphorbia laciniloba* is similar to *E. petala* and *E. ophiolitica* (P.I.Forst.) Y.Yang. It differs from *E. petala* by having styles bifid 1/3 to 1/2 of their length (versus styles entire or scarcely bifid for *E. petala*), gland appendages deeply lacinate with acute to attenuate lobes (versus toothed or shallowly lobed with lobes rounded or obtuse at tip for *E. petala*), capsules only slightly broader at the base (versus distinctly broader at the base for *E. petala*) and growing on mostly clay soils (versus growing on sandy soils for *E. petala*). It differs from *E. ophiolitica* by having smaller seeds, $1.1\text{--}1.6 \times 0.7\text{--}1 \times 0.7\text{--}1$ mm (versus $1.7\text{--}1.8 \times 1\text{--}1.1 \times 1\text{--}1.1$ mm for *E. ophiolitica*) and leaf blades oblong to oblong-elliptic or ovate, 1.6–2.8 times as long as wide (versus elliptic to broad elliptic, 1–1.5 times long as wide for *E. ophiolitica*).

Etymology: The specific epithet is from Latin *laciniatus*, slashed into narrow divisions with tapered-pointed incisions, and *lobus*, lobe, in reference to the divided gland appendages of this species.

26. Euphorbia litticola Halford & W.K.Harris, **species nova** quoad habitationem litoralem foliorum crassitudinem, cyathiorum dispositionem, seminum formam, amplitudinem sculturamque similis *E. pallenti* Dillwyn sed habitu robustiore caulibus crassioribus usque 5 mm diam. in internodiis (ad vicem caulibus usque 3.5 mm) stipulis chartaceis lato-ovatis 1.5–3 mm longis glabris superficiebus ambabus (ad vicem stipulis \pm coriaceis triangularibus 1–1.5 mm longis pubescentibus in superficiebus adaxialibus) basibus foliorum symmetricis cordatisque usque auriculatis (ad vicem basibus asymmetricis hinc cordatis illinc obtusis usque leviter cordatis) differt. **Typus:** Northern Territory. Melville Island, 7 km NW of Point Elly, 28 November 1989, *P.I. Forster PIF6113 & R. Petherick* (holo: BRI; iso: MEL, according to label information on the holotype sheet there are duplicates (isotypes) lodged at CNS [formerly QRS] *n.v.* & DNA *n.v.*).

Euphorbia levis var. *imbricata* Boiss., in A.DC., *Prodr.* 15(2): 13 (1862). **Type:** [Northern Territory.] Port Essington, *s.d.*, [*J.W.*] *Armstrong s.n.* (holo: K).

Illustrations: Wheeler (1992: figs 183A, 184A, 185A, 186A) as *Euphorbia atoto*; Dunlop *et al.* (1995: 218, fig. 72), as *Euphorbia atoto*.

Monoecious, herbaceous perennial to 70(150) cm high, many stems arising from woody rootstock, the whole plant glabrous. **Stems** decumbent to erect (rarely rhizomatous, *Dunlop 9793 & Wightman* [DNA]), much branched, smooth. **Interpetiolar stipules** broad-triangular, 2–3 mm long, chartaceous, reddish brown, entire or bifid at apex, glabrous; margin lacerate. **Leaves:** petiole 1–2 mm long, smooth; blade oblong, ovate or oblong-elliptic, 18–32 mm long, 8–16 mm wide, 1.8–2.5 times longer than wide; adaxial surface blue-green sometimes with reddish tinge, smooth or minutely papillose; abaxial surface similar to but paler than adaxial surface; base \pm symmetric, auriculate to cordate; margin entire or serrulate; apex obtuse to rounded with short apiculate tip. **Cyathia** in congested 2 or 3 branched dichasial cymes together with a solitary cyathium at the distal nodes; peduncles 5–10

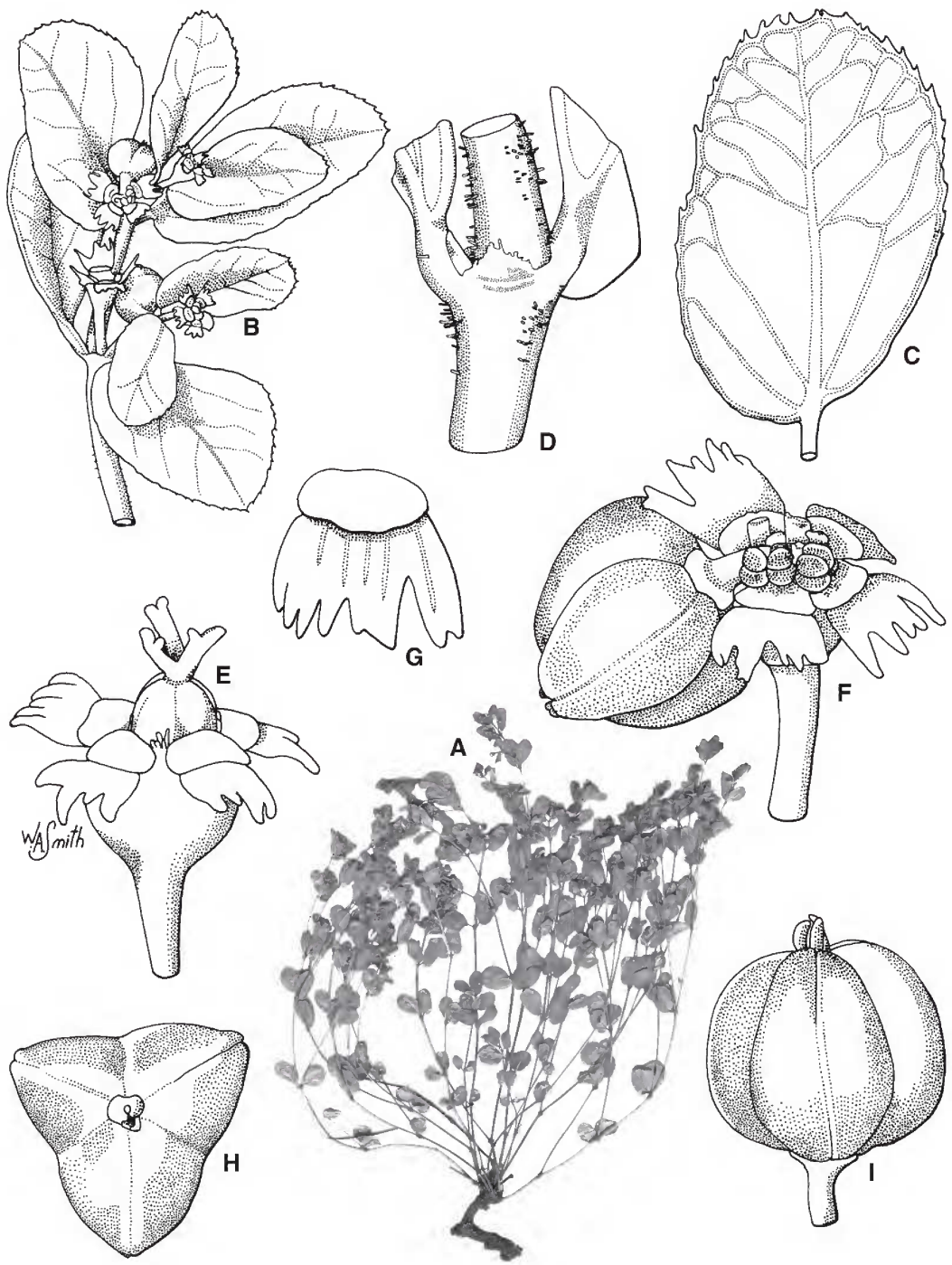


Fig. 10. *Euphorbia laciniiloba*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 4$. C. leaf $\times 6$. D. stipules $\times 12$. E. cyathia with female flower $\times 24$. F. capsule with cyathia $\times 16$. G. cyathial gland with appendage, adaxial view $\times 24$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. All from Halford Q8793 & Batianoff (BRI). Del. W. Smith.

mm long; bracts leaf-like but smaller than the primary stem leaves; cyathial peduncles 1–9 mm long. **Involucres** turbinate or cupuliform, 1.5–1.8 mm long, 1.6–1.8 mm across; lobes 5, triangular, 0.6–0.8 mm long, margin lacinate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-elliptic in outline, 0.4–0.5 mm long, 0.6–1 mm wide, green or yellowish green; gland appendages inconspicuous or absent, spreading radially, transverse-linear or lunate, 0.1–0.3 mm long, 0.9–1 mm wide, white, glabrous, margin entire or dentate; bracteoles 1.5–1.9 mm long, adnate for 1/2–2/3 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** c. 25 per cyathium; pedicels 1.5–2.2 mm long; staminal filaments 0.6–0.7 mm long. **Pistillate flowers**: styles 0.8–1 mm long, ascending, smooth, glabrous, each bifid for c. 1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 6 mm long, very broad-ovate in lateral view, 3–3.2 mm long, 3.7–4.2 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** very broad-elliptic in outline, 1.7–1.8 mm long, 1.4–1.6 mm tangentially, 1.5–1.7 mm radially, suborbicular in cross section, dorsal and ventral faces convex, smooth; exotesta thin, of even thickness over surface, chalky-white, microreticulate, not becoming mucilaginous when moistened; endotesta brown. **Figs 11, 26K.**

Additional selected specimens examined: **Western Australia.** Cape Anjo, Jul 1973, *Wilson 11303* (PERTH); Wollaston Island, Jun 1972, *Marchant 72/316* (PERTH); Krait Bay, Cape Voltaire, Bonaparte Archipelago, May 1998, *Mitchell 5422* (BRI, PERTH); Vansittart Bay at E end of airstrip on Anjo Peninsula, Jun 1992, *Kenneally 11232* (DNA, PERTH). **Northern Territory.** New Year Island, Apr 1995, *Booth 518* (DNA); Melville Island, Penelli Beach, Jun 1992, *Cowie 2187 & Cowie* (DNA); Cobourg Peninsula, Trepang Bay, Apr 1993, *Cowie 3605* (DNA); Mountnorris Bay, foot of Cobourg Peninsula, c. 35 km W of Murgarella, Jun 1988, *Munir 6125* (AD, BRI); Black Point, Cobourg Peninsula, Oct 1968, *Byrnes NB1094 & Maconochie* (AD, DNA); Annesley Point, Malay Bay, Jun 1988, *Munir 6097* (AD, BRI); Grant Island, May 1992, *Dunlop 8983* (DNA); Murgarella, Malay Bay, Jul 1985, *Wightman 1971* (DNA); Arnhem Land, S side Anuru Bay, Oct 1992, *Cowie 3123* (DNA, MEL); Cotton Island, May 1992, *Cowie 2941* (DNA); English Company Islands, Truant Island, Jul 1992, *Leach 3038* (DNA); Wigram Island, Outstation, Aug 1995,

Cowie 6062 (DNA); Port Bradshaw, Sep 1993, *Dunlop 9793 & Wightman* (DNA). **Queensland.** COOK DISTRICT: Aurukun Reserve, 5 km S of Kirke River mouth, Oct 1978, *Smyth s.n.* (BRI [AQ412998]); BURKE DISTRICT: 10 km W of Massacre Inlet, Wentworth Station, Dec 1984, *Halford 841217* (DNA); Charlie Bush Bay, Mornington Island, Sep 1981, *Fosberg 62011* (BRI).

Distribution and habitat: *Euphorbia litticola* occurs in coastal areas from Bonaparte Archipelago, Kimberley, WA, across the NT to Aurukun on the west coast of Cape York Peninsula, Qld (**Map 26**). It most likely extends into the Indonesian Archipelago. It grows on sandy coastal foreshores usually just above the strand line.

Phenology: Flowers and fruits have been collected throughout the year, more frequently from April to July.

Notes: *Euphorbia litticola* is similar to *E. pallens* Dillwyn in its coastal habitat, leaf thickness, cyathia arrangement and seed shape, size and sculpturing. It differs from *E. pallens* by its more robust habit with thicker stems (up to 5 mm diameter at internodes as compared with up to 3.5 mm diameter for *E. pallens*), stipules chartaceous, broad-ovate, 1.5–3 mm long and glabrous on both surfaces (versus stipules ± leathery, triangular, 1–1.5 mm long and pubescent on the adaxial surface for *E. pallens*) and leaf bases symmetrical cordate to auriculate (versus asymmetrical, with one side cordate, the other obtuse to shallowly cordate for *E. pallens*).

Etymology: The specific epithet is from Latin *littus*, sea-shore, beach, and *-icola*, dweller or inhabitant, in reference to the where this species has been recorded growing.

27. *Euphorbia macdonaldii* Halford & W.K.Harris, **species nova** similis *E. australi* Boiss. sed stylis integris plerumque brevioribus 0.2–0.3 mm longis (ad vicem 0.3–0.6 mm longis bifidis 1/3–2/3 longitudinis) capsulis lato-usque per lato-ovatis aspectu laterali manifeste latioribus basim versus (ad vicem lato ellipticis aspectu laterali manifeste latioribus aequatorem versus) plerumque seminibus minoribus 0.7–0.9 × 0.5–0.6 × 0.5–0.7 mm (ad vicem seminibus 0.8–1.6 × 0.6–0.9 × 0.6–0.9 mm) differt. **Typus:** Queensland. COOK DISTRICT: 1 km S of Lappa

on Mt Garnet road, 12 April 2005, *P.I. Forster* PIF30732 & *K.R. McDonald* (holo: BRI, iso: MEL, NSW, *distribuendi*).

Monoecious (rarely dioecious), herbaceous perennial to 15 cm high, few to many stems arising from woody taproot. **Stems** prostrate or ascending, much branched, smooth or sometimes longitudinally ridged, with a sparse to dense indumentum (rarely glabrous); hairs spreading, \pm straight, 0.5–1.0 mm long, white. **Interpetiolar stipules** narrow-triangular to triangular, 0.2–0.7 mm long, bipartite, indumentum as for stems or glabrous; margin lacinate. **Leaves:** petiole 0.4–1.2 mm long, smooth, glabrous or with indumentum as for stems; blade oblong, oblong-elliptic, elliptic to broad-elliptic or oblong-obovate, 4–9.5 mm long, 2.5–7 mm wide, 1–1.9 times longer than wide; adaxial and abaxial surfaces red to pink or green with reddish tinge over surface or along margin, smooth (rarely papillose, *Henshall* 379 [BRI]), glabrous or with a moderately dense indumentum; hairs spreading, straight, 0.1–0.3 mm long; base asymmetric with one side cordate to rounded, the other cuneate to rounded; margin serrulate to serrate or only toothed distally; apex rounded to retuse. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.4–0.6 mm long, smooth, glabrous. **Involucres** turbinate, 0.8–1.2 mm long, 0.7–1.3 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin entire; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong to transverse-elliptic in outline, 0.2–0.4 mm long, 0.3–0.6 mm wide, pink, cream to yellow; gland appendages inconspicuous, spreading radially, transverse-oblong to transverse-linear or lunate, 0.1–0.4 mm long, 0.5–0.8 mm wide, pink, glabrous, margin dentate, irregularly shallowly lobed or entire; bracteoles 0.1–0.8 mm long, divided into few to numerous subulate glabrous segments. **Staminate flowers** 5–15 per cyathium; pedicels 0.8–1.1 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, spreading to ascending, smooth, glabrous or pubescent abaxially,

entire, the apices terete. **Capsules** exserted from involucre on pedicel to 2.5 mm long, broad to very broad-ovate in lateral view, 1.1–1.4 mm long, 1.3–1.6 mm across, shallowly 3-lobate with keels obtuse or acute, \pm smooth or minutely papillose, glabrous or sparsely to densely hairy; hairs white spreading, 0.1–0.3 mm long; hypogynous disc entire. **Seeds** ovate in outline, 0.7–0.9 mm long, 0.5–0.6 mm tangentially, 0.5–0.6 mm radially, tetraquetrous in cross section; dorsal and ventral faces planar or concave, smooth or with faint transverse or irregular ridges; exotesta thin, of even thickness over surface, grey-white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown.

Distribution and habitat: *Euphorbia macdonaldii* occurs in north-eastern Qld, from near Chillagoe south to near Mt Coolon with a disjunct population in the Nicholson River area, NT.

Notes: *Euphorbia macdonaldii* is similar to *E. australis* but differs by having entire styles which are generally shorter (0.2–0.3 mm long versus styles 0.3–0.6 mm long and bifid for 1/3–2/3 of the length for *E. australis*), broad to very broad-ovate capsules in lateral view which are distinctly broader towards the base (versus broad-elliptic in lateral view and distinctly broader towards the equator for *E. australis*) and generally smaller seeds ($0.7-0.9 \times 0.5-0.6 \times 0.5-0.7$ mm versus $0.8-1.6 \times 0.6-0.9 \times 0.6-0.9$ mm for *E. australis*).

As circumscribed here, this species exhibits discontinuity in density, distribution and length of the indumentum. Two varieties are here formally recognised which can be distinguished using the following key.

Etymology: The specific epithet honours Keith R. McDonald, formerly of the Threatened Species Unit, Department of Environment & Heritage Protection, whose botanical collections have added much to the knowledge of the flora of Queensland.

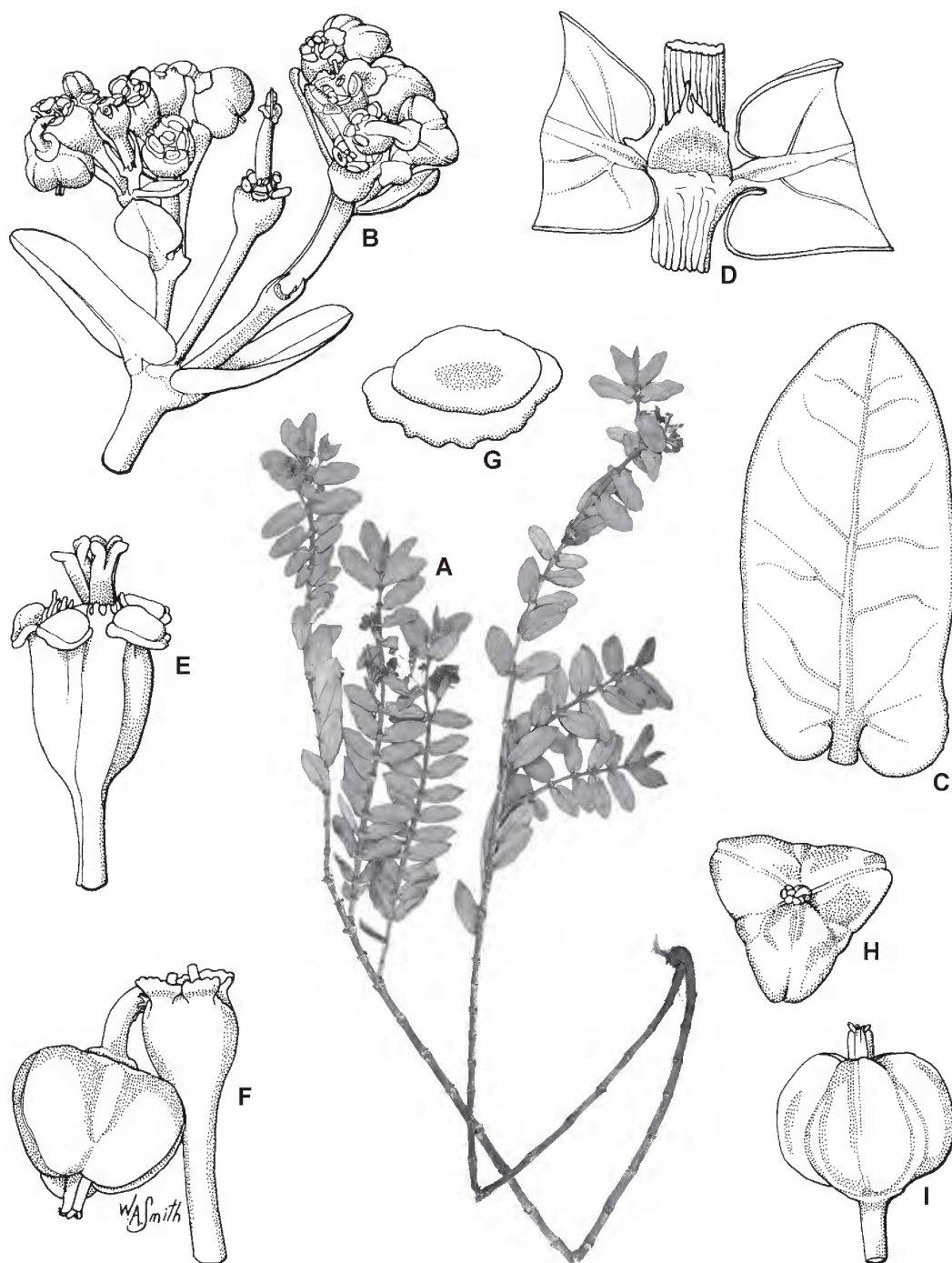


Fig. 11. *Euphorbia litticola*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 3$. C. leaf $\times 3$. D. stipules $\times 6$. E. cyathia with female flower $\times 12$. F. capsule with cyathia $\times 6$. G. cyathial gland with appendage, adaxial view $\times 24$. H. capsule, top view $\times 6$. I. capsule, lateral view $\times 6$. A–D, F–I from Forster PIF6113 & Petherick (BRI); E from Cowie *et al.* 2187 (DNA). Del. W.Smith.

Key to varieties of *Euphorbia macdonaldii*

Stems, leaves and capsules with a moderately dense to dense indumentum;

hairs 0.1–0.5 mm long **27a. *E. macdonaldii* var. *macdonaldii***

Stems, leaves and capsules glabrous or with a sparse indumentum; hairs 0.5–

1 mm long. **27b. *E. macdonaldii* var. *potentillina***

27a. *Euphorbia macdonaldii* var. *macdonaldii*

Euphorbia australis var. *canescens* Domin, *Biblioth. Bot.* 89(4): 310 (1927 '1926'). **Type:** Queensland. [NORTH KENNEDY DISTRICT:] Mt Remarkable apud opp. Pentland, Feb 1910, *K. Domin s.n.* (holo: PR 528297).

Herbaceous perennials to 10 cm high, many stems arising from woody taproot. **Stems** prostrate or weakly ascending, moderately dense to dense hairy (hispid); hairs 0.1–0.5 mm long. **Leaves:** petiole 0.5–1 mm long; blade oblong-elliptic or oblong-obovate, 4–9.5 mm long, 2.5–5 mm wide, 1.4–1.9 times longer than wide; adaxial and abaxial surfaces smooth (rarely papillose), with a moderately dense indumentum consisting of hairs 0.1–0.3 mm long; margin toothed distally; apex rounded. **Involucres** 0.8–1.2 mm long, 0.7–1.3 mm across; glands 0.2–0.4 mm long, 0.3–0.6 mm wide, pink or cream to yellow; gland appendages transverse-oblong to transverse-linear, to 0.4 mm long, 0.5–0.8 mm wide, pink, margin dentate or irregularly shallowly lobed. **Staminate flowers** 5–15 per cyathium. **Capsules** shallowly 3-lobate with keels obtuse, ± smooth, sparsely to densely hairy; hairs spreading, 0.1–0.3 mm long. **Figs** 12, 26L.

Additional selected specimens examined: Northern Territory. Nicholson River area, Jun 1974, *Henshall* 379 (BRI, DNA). **Queensland.** COOK DISTRICT: 16 km NW of Mt Garnet on Lappa Road, Jun 2000, *Forster PIF25802* (BRI); 13.5 km S along Lappa to Mt Garnet Road, Apr 2005, *Forster PIF30797 & McDonald* (BRI); 11.4 km along Sundown Road from junction with Kennedy Highway, Apr 2006, *McDonald KRM5072* (BRI); Pinchgut Creek, base of Pinchgut Hill, NE of Chillagoe, Mar 2005, *McDonald KRM3913 & Little* (BRI); 36 [km] SW of Mt Garnet beside the road to 'Sundown', Mar 2005, *Wannan* 3888 (BRI); 11.5 km along Sundown Road to Almaden/Mt Surprise off Kennedy Highway, May 2006, *Forster PIF31477 & McDonald* (BRI); 28.8 km S along Lappa to Mt Garnet Road, Apr 2005, *Forster PIF30802 & McDonald* (BRI); 16 km NW of Mt Garnet, on road to Lappa, Jan 1993, *Bean* 5462 & *Forster* (BRI);

Stannary Hills, 11 km S of Mutchilba, Portion 603, May 2006, *Forster PIF31590 & McDonald* (BRI); Stannary Hills, 9.5 km S of Mutchilba, Portion 603, May 2006, *Forster PIF31469 & McDonald* (BRI); Copperfield River, Kidston Goldmine Water Supply Dam, Gilbert Range, Feb 1994, *Forster PIF14891 & Bean* (BRI). NORTH KENNEDY DISTRICT: 22.9 km S of turnoff to Einasleigh on Kennedy Developmental Road, Jul 2000, *Cumming* 19867 (BRI); Humpybong track, High Range, c. 40 km SW of Townsville, Feb 1999, *Cumming* 18617 (BRI); on track towards lottery turnoff, just W of Warrigal Creek, 7.2 km ESE of Flinders Highway, SW of Pentland, Aug 1988, *Cumming* 8282 (BRI); Pentland, Jun 1934, *Blake* 6061 (BRI); 100 km S of Charters Towers on road to Lornesleigh Station, May 2006, *Halford Q9079 & Batianoff* (BRI); Charters Towers, *s.d.*, *Plant* 190 (BRI); 6 km E of Mt Cooper homestead, Jun 1992, *Thompson CHA133 & Sharpe* (BRI). SOUTH KENNEDY DISTRICT: Mt Coolon – Collinsville Road, 0.9 km E of Deception Creek – W side of road site 96/3, Jan 1996, *Champion* 1296 & *Pollock* (BRI).

Distribution and habitat: *Euphorbia macdonaldii* var. *macdonaldii* is confined to north-eastern Qld, from near Chillagoe south to near Mt Coolon with a disjunct population in the Nicholson River area, NT (**Map 27a**). It grows in eucalypt woodland communities on sandy soils most often on rocky granitic hills, but also on rhyolitic or sandstone hills.

Phenology: Flowers and fruits have been collected from January to August.

27b. *Euphorbia macdonaldii* var. *potentillina* (Baill.) Halford & W.K. Harris **combinatio nova**; *Euphorbia australis* var. *potentillina* Baill., *Adanson* 6: 283–284 (1866). **Type:** Queensland. *s.loc.*, *s.d.*, [*E.M.*] *Bowman s.n.* [202/62] (holo: P 698528, element top left hand corner, *n.v.* (image seen); iso: MEL 1560384).

Euphorbia australis var. *semiglabra* Domin, *Biblioth. Bot.* 89(4): 310 (1927 '1926'). **Type:** Queensland. [COOK DISTRICT:] apud opp. Chillagoe, February 1910, *K. Domin s.n.* (lecto, [here designated]: PR 528301).

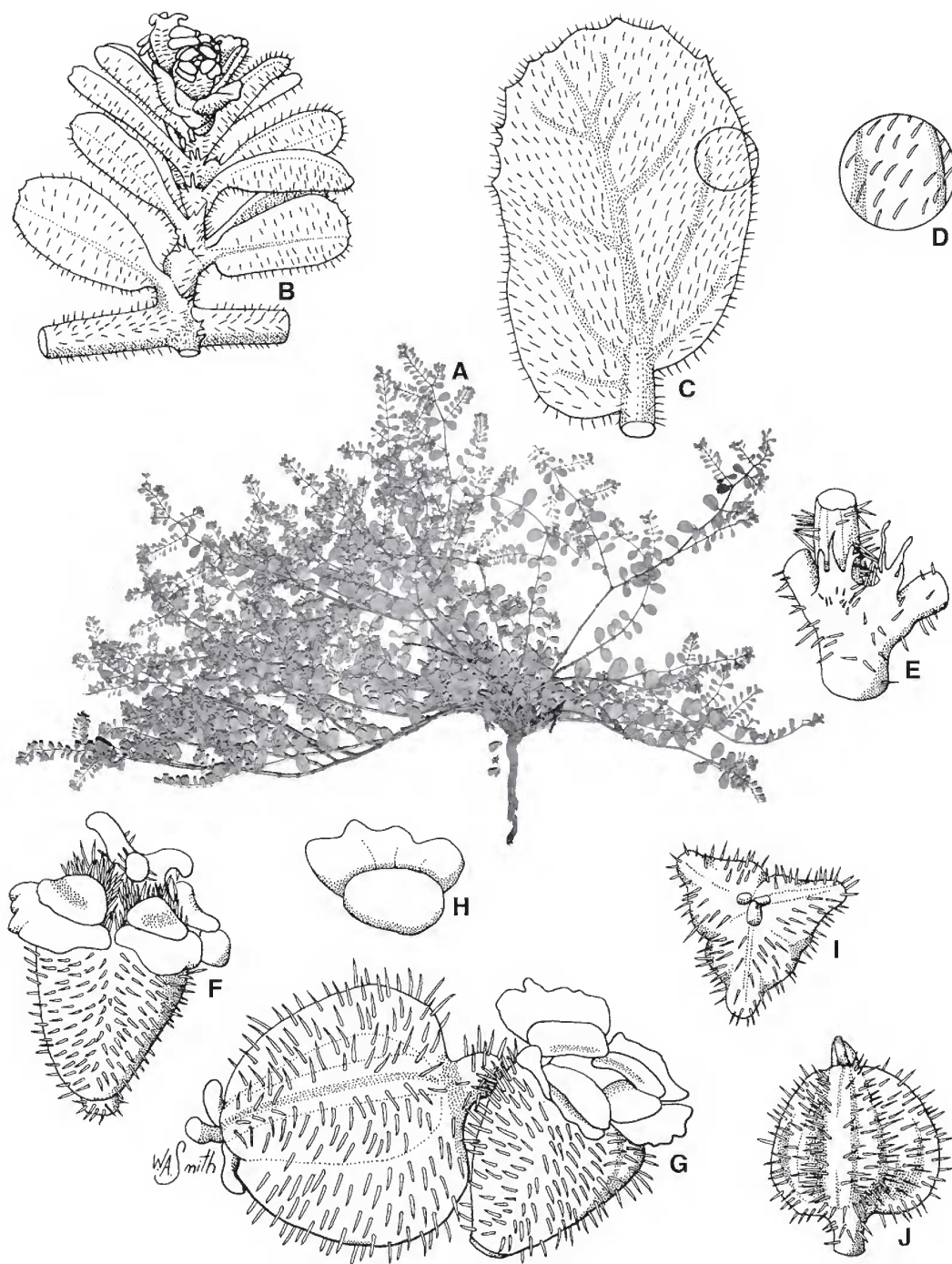


Fig. 12. *Euphorbia macdonaldii* var. *macdonaldii*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. indumentum on lower leaf surface $\times 16$. E. stipules $\times 16$. F. cyathia with female flower $\times 24$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule with cyathia $\times 24$. I. capsule, top view $\times 16$. J. capsule, lateral view $\times 16$. A from Forster PIF31477 & McDonald (BRI); B–D, F–J from Forster PIF30732 & McDonald (BRI); E from McDonald KRM5072 (BRI). Del. W.Smith.

Herbaceous perennials to 15 cm high, with few to many annual stems arising from slightly thickened rootstock. **Stems** prostrate or ascending, sparsely hairy (pilose) (rarely glabrous); hairs 0.5–1.0 mm long. **Leaves**: petiole 0.4–1.2 mm long; blade oblong, elliptic to broad-elliptic, 5.5–9 mm long, 4.5–7 mm wide, 1–1.5 times longer than wide; adaxial and abaxial surfaces smooth, glabrous or with scattered hairs 0.5–1 mm long; margin serrulate to serrate; apex rounded to retuse. **Involutres** 0.9–1 mm long, 1–1.1 mm across; glands 0.2–0.3 mm long, 0.4–0.5 mm wide, pink; gland appendages transverse-oblong or lunate, 0.1–0.2 mm long, 0.7–0.8 mm wide, pink, margin entire or shallowly lobed. **Staminate flowers** 5 per cyathium. **Capsules** shallowly 3-lobate with keels acute, smooth or minutely papillose, glabrous. *n* = 11. **Fig. 26M.**

Additional selected specimens examined: Queensland. COOK DISTRICT: 6.7 km along Pormpuraaw Road from Gulf Development Road junction near Musgrave, May 2010, *McDonald KRM9190* (BRI); on a hillside to the E of the road to the OK Mine, on Nychum Station and 15 km WSW of the homestead, Aug 2003, *Fox IDF2428* (BRI); 7.2 km by road towards Ootann from junction with Burke Development Road near Almaden, Jan 2005, *McDonald KRM3512* (BRI); 24 km W of Dimbulah, May 1976, *Hassall 7618* (BRI); 45 km by road S of Mt Garnet, Feb 2006, *McDonald KRM4795* (BRI); Mt Zero property, off Ewan – Laroon Road, c. 100 km W of Townsville, Feb 2005, *Cumming 23180* (BRI).

Distribution and habitat: *Euphorbia macdonaldii* var. *potentillina* occurs from near Musgrave, Cape York Peninsula, south to the Paluma Range, Qld (**Map 27b**). It is recorded as growing in eucalypt woodland communities on sandy soils on small hills, most often on granite but also on rhyolite.

Phenology: Flowers and fruits have been collected in January, February and August.

Typification: Domin (1927) cited two of his collections in the protologue of *Euphorbia australis* var. *semiglabra* namely “Chillagoe (DOMIN II. 1910) ... Mungana (DOMIN II. 1910)”. Two collections, which are considered as syntypes of the name *E. australis* var. *semiglabra*, have been located amongst material of *Euphorbia* on loan to BRI from PR [**a**: *Euphorbia australis* var. *typica*, Queensland: in xerodrymio apud opp.

Mungana, Jan 1910, *Domin* (Iter Australiense nr 5741), (PR 528300); **b**: *Euphorbia australis* var. *typica*, Queensland: apud opp. Chillagoe, Feb 1910, *Domin* (Iter Australiense nr 5742) (PR 528301). The collection from near Chillagoe [PR 528301] is here selected as lectotype because it is part of the original material and has morphology that matches the description in the protologue of this variety. The syntype collected near Mungana (PR 528300) is referable to *E. schultzei* var. *comans*.

Notes: *Euphorbia macdonaldii* var. *potentillina* differs from the typical variety by the characters set out in the key above.

28. Euphorbia maconochieana B.G.Thomson, *Nuytsia* 8: 354, 356, fig. 3 (1992). **Type:** Northern Territory. Cahill’s Crossing, Victoria River crossing on the Top Springs to Victoria River Downs Road, 26 March 1990, *B.G.Thomson 3486* (holo: DNA *n.v.*; iso: AD *n.v.*, BRI, PERTH *n.v.*, *fide* Thomson [1992: 354]).

Illustrations: Wheeler (1992: figs 184S, 185S, 186S), as *Euphorbia* sp. C; Thomson (1992: 355, fig. 3).

Monoecious, annual, few to many stems arising from the base. **Stems** prostrate, sparingly to much branched, ± smooth, with a sparse to moderately dense indumentum; hairs ± spreading or appressed, straight, crispate or curved, to 0.2 mm long, white. **Interpetiolar stipules** narrow-triangular, 0.4–1 mm long, bipartite, with indumentum as for stems; margin entire. **Leaves**: petiole *c.* 0.5 mm long, smooth, with indumentum as for stems; blade narrow-oblong to oblong, narrow-ovate to ovate or obovate, 7–16 mm long, 2–7 mm wide, 1.8–2.7 times longer than wide; adaxial surface colour unknown, smooth or papillose, glabrous or with a sparse to moderately dense indumentum consisting of spreading, straight or curved hairs to 0.1 mm long; abaxial surface colour unknown, smooth or papillose, with a sparse to moderately dense indumentum consisting of spreading, curved hairs to 0.3 mm long; base asymmetric with one side cordate, the other cuneate; margin sparingly minutely to coarsely toothed or entire; apex rounded,

obtuse or acute. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 1–2.5 mm long, smooth, with indumentum as for stems. **Involucres** cupuliform, 1.3–1.5 mm long, 1.5–1.8 mm across; lobes 5, triangular, 0.5–0.8 mm long, margin fimbriate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong or transverse-elliptic in outline, 0.3–0.4 mm long, 0.4–0.5 mm wide, pink to dark red; gland appendages conspicuous, spreading radially, reniform, (0.1)0.3–1.5 mm long, 0.5–1.7 mm wide, white or rarely pale pink, glabrous, margin entire; bracteoles 0.9–1.6 mm long, adnate for c. 1/2 of their length to involucre, free portion divided into numerous subulate hirsute segments. **Staminate flowers** 15–32 per cyathium; pedicels 1–1.4 mm long; staminal filaments 0.4–0.5 mm long. **Pistillate flowers**: styles 0.7–1 mm long, connate at the base into a column for c. 1/8 of their length, erect with spreading apices, papillose proximally, glabrous, each bifid for 1/3–2/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3.5 mm long, very broad-ovate or broad-elliptic in lateral view, 1.7–1.8 mm long, 1.7–2.2 mm across, shallowly 3-lobate with keels obtuse, papillose, glabrous or sparsely hairy; hairs spreading, c. 0.1 mm long; hypogynous disc entire. **Seeds** ovate in outline, 1–1.1 mm long, 0.6–0.8 mm tangentially, 0.6–0.7 mm radially, tetraquetrous to tetragonous in cross section; dorsal faces convex; ventral faces planar or slightly concave; all faces with faint narrow rounded irregular ridges; exotesta thin, of even thickness over surface, pale brown, microreticulate, becoming mucilaginous when moistened; endotesta brown. **Fig. 26N.**

Additional selected specimens examined: **Western Australia.** drain 7, Packsaddle Creek, Aug 1973, *Kenneally 1941* (PERTH); Smoke Creek, SW of Lake Argyle, May 1980, *Weston 12185* (PERTH); Nicholson Road, off Duncan Highway, Apr 1993, *Done s.n.* (PERTH 2984318); 47 km S of Forrest River crossing on Duncan Highway, Apr 1977, *Eichler 22400* (MEL); 3 km SE of Brooking Gorge, Apr 1988, *Cranfield 6438* (PERTH); Bow River Diamond Mine, 200 km S of Kununurra, Apr 1991, *Barrett BR14* (PERTH); Kununurra, Mar 1978, *Aplin 6286b* (PERTH). **Northern Territory.** 10 km NNE of Twins Mount on Palm Creek, Mar 1989,

Leach 2376 & Dunlop (DNA); 46 miles [c. 74 km] SW of Birrimbah Outstation, Jun 1949, *Perry 2078* (DNA); Gregory Creek, Mar 1992, *Brocklehurst 615* (DNA); Auvergne Station, plot 923, Mar 1998, *Harwood 437 & Brocklehurst* (DNA); Newry Station, 37 km E of WA/NT border, along Victoria Highway, Apr 1989, *Halford H61* (BRI, DNA); 5 km W [of] Top Springs Roadhouse, Mar 1990, *Thomson 3489* (BRI); 51 miles [c. 82 km] E [of] Victoria River Downs, May 1959, *Chippendale 6095* (DNA, MEL); 4 miles [c. 6 km] S of Willeroo Outstation, Jun 1949, *Perry 2025 & Lazarides* (BRI, DNA, MEL); 3 km W [of] Top Springs Roadhouse, Mar 1990, *Thomson 3488* (DNA); Victoria River District, site 30, Apr 1990, *Manning 569* (DNA); Kalkaringi, Mar 1990, *Thomson 3491* (DNA); Kelly Station, May 1994, *Egan 3937* (BRI, DNA); 10 km S [of] Victoria River Crossing, between Top Springs and Timber Creek, Jul 1974, *Carr 2730 & Beaglehole 46509* (MEL, NSW).

Distribution and habitat: *Euphorbia maconochieana* extends from Brooking Gorge near Fitzroy Crossing, Kimberley, WA, north east to the Fitzmaurice River and east to Wavehill Station, in the north-western part of the NT (**Map 28**). It grows in grassland or occasionally in open woodland communities, on dark heavy clays on plains or low rolling hills.

Phenology: Flowers and fruits have been collected from February to August with one collection in October.

Notes: *Euphorbia maconochieana* is similar to *E. papillifolia* but differs from that species in having longer styles, distinctly papillose capsules and smaller seeds.

29. *Euphorbia maculata L., *Sp. Pl.* 455 (1753); *Chamaesyce maculata* (L.) Small, *Fl. S.E. U.S. [Small]* 713 (1903). **Type:** “habitat in America septentrionali” (lecto: LINN [*Herb. Linn. No. 630.11*] n.v. (image seen) (IDC microfiche 177. 320: III. 3), *fide* Croizat [1962: 191]).

Euphorbia supina Raf., *Amer. Monthly Mag.* 2: 119 (1817); *Chamaesyce supina* (Raf.) Moldenke, *Annot. Classified List Moldenke Collect. Numbers* 135 (1939). **Type:** North America, not designated.

Illustrations: Lin *et al.* (1991: 240, fig. 15) as *Chamaesyce maculata*; Weber (1986: 749, fig. 401K); James & Harden (1990: 429), as *Chamaesyce supina*; Jeanes (1999: 61, fig. 9J).

Monoecious, annual to 10 cm high, many stems arising from slender taproot. **Stems** prostrate to weakly ascending, much branched, with a moderately dense indumentum on one side, smooth; hairs spreading or ascending-spreading, curved, to 0.8 mm long, white. **Interpetiolar stipules** subulate, 1–2.3 mm long, deeply bipartite; glabrous or with a few hairs on margin; margin entire or lacinate proximally. **Leaves:** petiole 1–1.8 mm long, smooth, with indumentum as for stems; blade narrow-oblong to oblong, 5–13 mm long, 2–4.5 mm wide, 1.7–4 times longer than wide; adaxial surface green to blue green, usually with elongated red spot centrally and reddish tinge along margins, smooth, glabrous; abaxial surface pale green, smooth, with a sparse to moderately dense indumentum consisting of appressed-ascending to spreading, curved hairs 0.3–0.5 mm long; base asymmetric with one side rounded to auriculate, the other cuneate to obtuse; margin serrulate; apex acute to obtuse or rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.4–1 mm long, smooth, with a few scattered hairs or glabrous. **Involucres** turbinate, 0.4–0.8 mm long, 0.5–0.8 mm across; lobes (4)5, triangular, 0.2–0.4 mm long, margin fimbriate; glands 4, stipitate, cupuliform, with shallow central pit, transverse-oblong in outline, 0.1–0.15 mm long, 0.2–0.3 mm wide, pink, cream or yellowish green; gland appendages conspicuous, spreading radially, transverse-oblong, 0.1–0.3 mm long, 0.3–0.7 mm wide, white or pink, glabrous, margin entire or irregularly shallowly lobed; bracteoles 0.5–0.7 mm long, adnate for *c.* 1/5 of their length to involucre, free portion divided into few subulate hirsute segments. **Staminate flowers** 4–5 per cyathium; pedicels 0.6–1 mm long; staminal filaments 0.1–0.15 mm long. **Pistillate flowers:** styles 0.3–0.5 mm long, spreading, smooth, glabrous, each bifid for *c.* 1/3 of their length, apices clavate. **Capsules** exserted from involucre on pedicel to 2.3 mm long, very broad-ovate to depressed ovate in lateral view, 1.5–1.6 mm long, 1.5–1.8 mm across, shallowly 3-lobate with keels acute,

smooth or minutely papillose, with a sparse to moderately dense indumentum; hairs appressed, 0.1–0.2 mm long; hypogynous disc entire. **Seeds** ovate or broad-ovate in outline, 0.8–1 mm long, 0.6–0.7 mm tangentially, 0.6–0.7 mm radially, tetraquetrous in cross section; dorsal and ventral faces \pm planar or concave, with 2–5 rounded transverse ridges; exotesta thin, of even thickness over surface, pale brown or grey-white, microreticulate, becoming mucilaginous when moistened; endotesta red-brown. **Fig. 26O.**

Additional selected specimens examined: **Western Australia.** Broome, Sep 1992, *Kenneally KFK11346* (PERTH); South Perth, Apr 1982, *Perry 1294* (PERTH); Narrogin, Mar 2002, *Warren 654 & Rose* (PERTH). **Queensland.** MARANOA DISTRICT: Cavanough Park, St George, Feb 2004, *Halford Q8108 & Harris* (BRI). DARLING DOWNS DISTRICT: 200 m S of Mackenzie Road on Stanthorpe bypass, Apr 2002, *Halford Q7512 & Batianoff* (BRI). MORETON DISTRICT: Brisbane Botanic Gardens, Mt Coot-tha, Jan 1999, *Halford Z1753* (BRI). **South Australia.** Lofly South, 25 Canopus Avenue, Hope Valley, Jan 1989, *Alcock 11028* (AD, BRI); 59 Thomas Street, Unley, Adelaide, Feb 1984, *Symon 13784* (AD, BRI); 21 Para Road, Evanston, Mar 1976, *Alcock 5361* (AD). **New South Wales.** Tamworth City Council Nursery, Oxley Park, Tamworth, Apr 1999, *Hosking 1707 & Bayliss* (MEL); Botanic Gardens, Sydney, Feb 1976, *Rodd 3021* (BRI, NSW); Buronga, Silver City Highway, near the bottle shop at Stanley Wineries, Dec 2000, *Browne 1126* (NSW). **Australian Capital Territory.** Australian National Botanic Gardens, Feb 1990, *Telford 10899* (AD, MEL). **Victoria.** Cobram township, Apr 2001, *McMamus s.n.* (MEL 2096409); St James Parade, Elsternwick, Melbourne, Apr 1985, *LeBreton 25* (MEL, NSW); South Yarra, Royal Botanic Gardens, Mar 1998, *Clarke 2865* (MEL).

Distribution and habitat: *Euphorbia maculata* is most likely native to North America, but has become widely naturalised around the world. In Australia it is naturalised in all mainland States (**Map 29**). It grows in mostly urban areas on roadsides, in lawns, garden beds and pathways.

Phenology: Flowers and fruits have been collected throughout the year, particularly from December to May.

Notes: In Australia, the name *Euphorbia thymifolia* L. has often been misapplied to this species (Anderson 1939; Jacobs & Pickard 1981; Stanley & Ross 1983). *Euphorbia maculata* can be distinguished from *E. thymifolia* by having capsules at

maturity fully exerted from the involucre versus the capsules at maturity half included within the involucre causing the involucre to split in *E. thymifolia*. Another morphological difference between these two species is that the cyathial gland appendages of *E. thymifolia* are generally unequal in size versus mostly equal for *E. maculata* (P. Berry, *pers. comm.*). We have not observed this difference in the Australian collections of the two species.

Euphorbia maculata may be confused with another naturalised weedy species in Australia, *E. prostrata* Aiton. It differs from *E. prostrata* in having \pm appressed hairs evenly spread over the capsules, whereas the hairs on the capsules of *E. prostrata* are spreading and confined to the keels.

30. *Euphorbia mitchelliana* Boiss., in A.DC., *Prodr.* 15(2): 25 (1862); *Chamaesyce mitchelliana* (Boiss.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. PORT CURTIS DISTRICT:] Port Curtis [Gladstone area], November 1847, *J. MacGillivray* 83 (lecto [here designated]: K 186478, element on left; isolecto: K 186479).

Monoecious, annual or herbaceous perennial with woody taproot, 80 cm high, few to many stems arising from rootstock. **Stems** prostrate, decumbent or erect (rarely rhizomatous), sparsely to densely hairy or glabrous, smooth; hairs ascending to spreading, crispate, 0.1–0.8 mm long, white. **Interpetiolar stipules** subulate, 0.6–1 mm long, entire or bipartite, glabrous or pubescent; margin entire or laciniate. **Leaves:** petiole 0.8–2 mm long, smooth, glabrous or with indumentum as for stems; blade linear to lanceolate, narrow-oblong to oblong, elliptic to broad-elliptic or ovate, 7–70 mm long, 1–12 mm wide, 1.5–30 times longer than wide; both surfaces smooth; adaxial surface dark green or subglaucous, glabrous or sparsely pilose with spreading, straight to crispate hairs 0.4–1.3 mm long; abaxial surface pale green or glaucous, glabrous or sparsely to densely pilose with ascending to spreading, crispate hairs 0.1–1.3 mm long; base symmetric or asymmetric, cordate or obtuse; margin entire or minutely serrulate distally with gland-tipped teeth; apex rounded, obtuse or acute.

Cyathia in lax terminal dichasial cymes (sometimes becoming monochasial distally); bracts leaf-like but much smaller than the primary stem leaves, subulate to narrowly triangular; cyathial peduncles 1–6 mm long. **Involucres** turbinate or campanulate, 0.6–1.3 mm long, 0.7–1.8 mm across; lobes 5, triangular to subulate, 0.3–0.8 mm long, margin ciliate or laciniate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong to transverse-elliptic in outline, 0.1–1.2 mm long, 0.3–1.6 mm wide, yellowish green; gland appendages inconspicuous to conspicuous, spreading radially, broad-obovate, obdeltoid or oblong, 0.1–1.5 mm long, 0.5–2.2 mm wide, pink or white, glabrous, margin entire or shallowly to deeply irregularly lobed; bracteoles 0.5–0.6 mm long, adnate for 1/2–2/3 of their length to involucre, free portion divided into a few to many subulate glabrous or hirsute segments. **Staminate flowers** 5–50 per cyathium; pedicels 0.8–2.2 mm long; staminal filaments 0.2–0.6 mm long. **Pistillate flowers:** styles 0.4–1 mm long, spreading, smooth, glabrous, each bifid for 1/4–2/3 of their length, the apices terete. **Capsules** exerted from involucre on pedicel to 2.7 mm long, transversely broad-elliptic in lateral view, 1.5–2 mm long, 1.6–2.3 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous or with a sparse to moderately dense indumentum consisting of spreading or appressed hairs 0.1–0.4 mm long; hairs mostly evenly distributed over capsule rarely confined to keels; hypogynous disc entire. **Seeds** ovate to elliptic in outline, 1.2–1.4 mm long, 0.8–1 mm tangentially, 0.8–1 mm radially, tetragonous or trigonal in cross section; dorsal faces convex; ventral faces convex or \pm planar; all faces with 3–7 prominent narrow rounded transverse ridges; exotesta thin, of even thickness over surface, grey-white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown.

Distribution and habitat: *Euphorbia mitchelliana* is widespread across northern Australia from One Arm Point, WA, eastward through northern parts of the NT to Maryborough, in south eastern Qld.

Typification: Boissier (1862) in his protologue of *Euphorbia mitchelliana* states “Ad Port Curtis Australiae (Mitchell No. 231!, MacGillivray n. 83 et 63 in herb. Kew!)”. Four sheets (five collections) which are considered as syntypes of the name *E. mitchelliana*, have been located amongst material of *Euphorbia* on loan to BRI from K [a: “[Queensland. Belyando River] bed of large sandy river, sub-tropical New Holland, 11 Aug 1846, Lieut.-Col. Sir T.L. Mitchell 231”. There are two specimens on this sheet: element on left (K 186533) and an element on right (K 186532). The element K 186533 has attached to its stem a small label of white paper with “Euphorbia” and the letters “E.C.T.” written in pencil. The writing on the label appears to be in Alan Cunningham’s hand. Although it is certainly one of the elements used by Boissier in describing *E. mitchelliana* it is clearly not part of the *Mitchell 231* collection and not from the Belyando River area; b: “Voyage of Rattlesnake B. 63, Port Curtis, sandy beaches, Nov./47. J MG [J. McGillivray]” [K 186480]; c: “Voyage of Rattlesnake B. 83, Port Curtis, Nov./47, JMG[J. McGillivray]” [K 186478]. Also on this sheet is a *R. Brown* collection from the Northumberland Isles (K

186477). This is not considered to be part of the syntype material; d: “Vog of Rattlesnake B.83, Port Curtis, Dr McGillivray [ex herb Hook.]” [K 186479]. The collection (186478) is here selected as lectotype because it is part of the original material, is the more ample and complete of the five collections and has morphology that best matches the description in the protologue of this species. In 1989, B.G. Thomson annotated the K (186533) collection as lectotype but this was not published. All the syntypes are referable to *E. mitchelliana* var. *mitchelliana* as applied here.

Notes: *Euphorbia mitchelliana* is similar to *E. bifida* in seed shape and seed surface ornamentation but differs from that in having cyathia in lax terminal dichasial cymes sometimes becoming monochasial distally.

As circumscribed here, *E. mitchelliana* is morphologically variable. There is considerable variation in the general habit of plants, vestiture, leaf shape and size, involucre shape, and gland appendages shape, size and degree of lobing. This variation is considered sufficient to warrant formal recognition of three varieties within this species which can be distinguished using the following key.

Key to varieties of *Euphorbia mitchelliana*

- 1 Involucres turbinate ≤ 1 mm across; staminate flowers < 20 per cyathium; gland appendages small, to 0.6 mm long, usually narrower than or equal to gland width, toothed or deeply lobed . . . **30a. *E. mitchelliana* var. *mitchelliana***
1. Involucres campanulate, > 1 mm across; staminate flowers usually 20–50 per cyathium; gland appendages large, 0.5–1.5 mm long, usually wider than gland width, entire or shallowly lobed **2**
- 2 Stems prostrate or decumbent; leaf blades ovate, elliptic to oblong-elliptic, 10–40 mm long, 5–12 mm wide, 1.5–4.5(6) times as long as wide **30b. *E. mitchelliana* var. *filipes***
2. Stems erect to ascending, rarely prostrate; leaf blades linear to narrow-oblong, or narrow-lanceolate, 14–45 mm long, 2–7 mm wide, 5.5–20 times as long as wide. **30c. *E. mitchelliana* var. *longiloba***

30a. *Euphorbia mitchelliana* var. *mitchelliana*

Euphorbia mitchelliana var. *hirta* Boiss., in A.DC., *Prodr.* 15(2): 25 (1862); *Chamaesyce mitchelliana* var. *hirta* (Boiss.) D.C.Hassall,

Aust. J. Bot. 24: 640 (1976). **Type:** [Queensland.] bed of large sandy river [Belyando River], 11 August 1846, *Lieut.-Col. Sir T.L. Mitchell 231* (holo: K 186532, element on the right).

Euphorbia mitchelliana var. *oblongifolia* Boiss., in A.DC., *Prodr.* 15(2): 25 (1862). **Type:** [Australia.] Nova Holl., *s.d.*, *F.Bauer s.n.* (holo: W).

Euphorbia mitchelliana var. *cairnsiana* Domin, *Biblioth. Bot.* 89(4): 307 (1927 '1926'). **Type:** Queensland. [COOK DISTRICT:] in silvis mixtis apud opp. Cairns solo arenoso, December 1909, *K.Domin s.n.* (lecto [here designated]: PR 528276).

Euphorbia mitchelliana var. *dietrichiae* Domin, *Biblioth. Bot.* 89(4): 307 (1927 '1926'). **Type:** [Queensland. MORETON DISTRICT:] prope Brisbane River, 1863–1865, *A.Dietrich 1882* (lecto [here designated]: PR 528274; isolecto: HBG 516202 *n.v.* (image seen), LD 1045446 *n.v.* (image seen)).

Euphorbia mitchelliana var. *filifolia* Domin, *Biblioth. Bot.* 89(4): 307 (1927 '1926'). **Type:** Queensland. [COOK DISTRICT:] in xerodrymio ad pedem montis Metal Mts apud opp. Chillagoe, February 1910, *K.Domin s.n.* (holo: PR 528279).

Slender annual or herbaceous perennial with few to many stems arising from woody rootstock, to 60 cm high. **Stems** decumbent to erect (rarely prostrate), sparsely hairy or glabrous. **Leaf blades** linear to narrow-oblong or narrow-lanceolate (rarely elliptic), 15–60 mm long, 1–10 mm wide, (2.5)7–30 times as long as wide, glabrous or sparsely hairy on both surfaces; apex rounded, obtuse or acute. **Involucres** turbinate, 0.6–1 mm long, 0.7–1 mm across; glands 0.1–0.3 mm long, 0.3–0.6 mm wide; gland appendages inconspicuous to conspicuous, broad-obovate or oblong, 0.1–0.6 mm long, 0.5–0.6 mm wide, pink or white, margin toothed or deeply lobed. **Staminate flowers** 5–15 per cyathium. **Capsules** glabrous or with a sparse indumentum consisting of appressed hairs. *n* = 8. **Fig. 26P.**

Additional selected specimens examined: **Western Australia.** 95 km W along Gibb River Road from the Great Northern Highway, Apr 1989, *Halford H27* (BRI); 4 km SW of One Arm Point, Apr 1992, *Carter 509* (PERTH); 2 km NW One Arm Point, Jan 1989, *Carter 346* (DNA, PERTH). **Northern Territory.** Grant Island, Apr 1995, *Booth 638* (DNA); Douglas Daly Research Farm, Jan 1998, *Michell 503* (DNA); old BHP flying

strip, Arnhem Land, Jun 1972, *Symon 7729* (AD); Bickerton Island, South Bay, Apr 1993, *Cowie 3881 & Leach* (DNA); c. 29 miles [c. 46 km] NE [of] Maranboy Police Station, Mar 1965, *Lazarides 19 & Adams* (DNA, MEL); Rose River, Gulf of Carpentaria, Jul 1972, *Dunlop 2701* (DNA); Limmen Bight River upper reaches, Jan 1989, *Thomson 2860* (DNA); 80 km SW [of] Elliott, Feb 1989, *Thomson 3210* (DNA). **Queensland.** COOK DISTRICT: 5 km E of Irvinebank near Jumna Mine, Feb 2004, *McDonald KRM1750* (BRI); 5.2 km E of Davies Creek Road from Kennedy Highway, Apr 1992, *Neldner 3843* (BRI). BURKE DISTRICT: 75.5 km by road from junction of Gulf and Burke Development Roads, towards Croydon, Jan 2005, *McDonald KRM3470* (BRI); c. 6 km SW of Normanton along the road to 'Mogoura' Station, Apr 1974, *Pullen 8842* (BRI, NSW). NORTH KENNEDY DISTRICT: Castle Hill, Townsville, Feb 1992, *Bean 4032* (BRI); near Mt Woodhouse, SW of Ayr, Oct 1950, *Blake 18657* (BRI). SOUTH KENNEDY DISTRICT: just E of Great Dividing Range, c. 36 km NNW of Yarrowmere Station homestead, Oct 1983, *Henderson H2872 et al.* (BRI). MITCHELL DISTRICT: 37 km W of Jericho on the Jericho – Barcaldine Road, Jul 1975, *Beeston 1249C* (BRI). GREGORY NORTH DISTRICT: Hamilton River, 5 km NW of 'Toolebuc', Jun 1978, *Purdie 1209* (BRI). PORT CURTIS DISTRICT: near Castle Tower N.P., c. 19.5 km NW of Bororen, May 1995, *Thompson CAL215 & Turpin* (BRI).

Distribution and habitat: *Euphorbia mitchelliana* var. *mitchelliana* is widespread across northern Australia from One Arm Point, WA, eastward through northern NT to Maryborough, south-eastern Qld (**Map 30a**). It grows in a wide variety of Melaleuca/eucalypt woodland/open forest communities on rocky hills, plains or coastal dunes. The soils are mostly sandy in texture and derived from a variety of substrates.

Phenology: Flowers and fruits have been collected throughout the year.

Typification: Domin (1827) in his protologue of *E. mitchelliana* var. *cairnsiana* states "Nordost-Queensland: Mischwälder liei Cairns, auf Sand (Domin XII. 1909)". Two sheets (PR 528273, PR 528276), which are considered by us as syntypes of the name *E. mitchelliana* var. *cairnsiana*, have been located amongst material of *Euphorbia* on loan to BRI from PR. The collection (PR 528276) is here selected as lectotype because it is part of the original material, is the more ample and complete of the two sheets and has morphology matching the description in the protologue of this variety. Both syntypes are referable to *E. mitchelliana* var. *mitchelliana* as applied here.

Domin (1827) in his protologue of *Euphorbia mitchelliana* var. *dietrichiae* states "Queensland: s.l., A. Dietrich No. 640, 873, 925, 988, 1882; Savannenwälder bei Mareeba und zwischen Chillagoe und dem Walsh River (Domin II. 1910)". A total of seven sheets [*A. Dietrich* 640 (PR 528284); *A. Dietrich* 873 (PR 528275); *A. Dietrich* 925 (PR 528282); *A. Dietrich* 988 (PR 528285); *A. Dietrich* 1882 (PR 528274); Feb 1910, *K. Domin s.n.* (PR 528271); Feb 1910, *K. Domin s.n.* (PR 528272)], which are considered by us as syntypes of the name *E. mitchelliana* var. *cairnsiana*, have been located amongst material of *Euphorbia* on loan to BRI from PR. The collection *A. Dietrich* 1882 (PR 528274) is here selected as lectotype because it is part of the original material, the more ample and complete of the syntypes seen and has morphology that best matches the description in the protologue of this variety. All the syntypes are referable to *E. mitchelliana* var. *mitchelliana* as applied here.

Notes: *Euphorbia mitchelliana* var. *mitchelliana* has leaf blades that are typically linear to narrow-oblong, or narrow-lanceolate. Leaf blades of collections from the central Qld coast and growing on coastal sands are generally elliptic in outline and resemble those of *E. mitchelliana* var. *filipes*. Some representative specimens of this variant are: PORT CURTIS DISTRICT: Statue Bay, c. 5 km SSE of Yeppoon, Aug 1976, *Henderson H2407* (BRI); Curtis Island, N of Southend towards Connor Bluff, Mar 1966, *Blake 22558* (BRI, MEL), Port Curtis [Gladstone area], Nov 1847, *MacGillivray 63* (K).

30b. *Euphorbia mitchelliana* var. *filipes* (Benth.) Halford & W.K.Harris **combinatio et status nova**; *Euphorbia filipes* Benth., *Fl. Austral.* 6: 51 (1873); *Euphorbia macgillivrayi* var. *filipes* (Benth.) Domin, *Biblioth. Bot.* 89(4): 311 (1927 '1926'); *Chamaesyce filipes* (Benth.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. BURKE DISTRICT:] Sweers Island, *s.d.*, *D.Henne s.n.* (lecto [here designated]: K 186472; isolecto: K 186469, MEL 2189021).

Euphorbia alsiniflora Baill., *Adansonia* 6: 288 (30 July 1866); *Chamaesyce alsiniflora*

(Baill.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. BURKE DISTRICT:] Bentink [Bentinck] Island, *s.d.*, *s.coll.* (lecto [here designated]: P 313099; isolecto: G-DC *n.v.* (microfiche IDC 800-73. 2419: II. 2)).

Herbaceous perennial to 50 cm high, with woody taproot, few to many stems arising from rootstock. **Stems** prostrate, decumbent (rarely erect), densely hairy or glabrous. **Leaf blades** ovate, elliptic to oblong-elliptic, 10–40 mm long, 3–12 mm wide, 1.5–4.5(6) times as long as wide; glabrous or sparsely to densely hairy on both surfaces, margin entire; apex rounded, obtuse. **Involucres** campanulate, 0.8–1.2 mm long, 1.2–1.5 mm across; glands 0.4–0.5 mm long, 0.4–0.7 mm wide; gland appendages conspicuous, broad-obovate, obdeltoid, 0.5–1.5 mm long, 1.1–2.2 mm wide, white, margin entire or shallowly lobed. **Staminate flowers** stamens 20–50 per cyathium. **Capsules** glabrous or with a sparse to moderately dense indumentum consisting of spreading hairs. *n* = 8.

Additional selected specimens examined: **Northern Territory.** Greenhill Island, Apr 1994, *Taylor 168* (DNA); North Goulburn Island, May 1992, *Dunlop 9052* (DNA); Little Mooroonga Island, Jun 1996, *Booth 1981* (DNA); Mouth of Glyde River, Dhipirrinjura, Jun 1996, *Booth 1840* (DNA); Bremer Island, Jul 1992, *Leach 2995* (DNA); Nyanantu Creek near mouth, Jan 1989, *Thomson 2886* (BRI, MEL, NSW); West Island, Sir Edward Pellew Group, Aug 1988, *Thomson 2694* (BRI); Vanderlin Island, Sir Edward Pellew Group, Jul 1988, *Thomson 2544* (DNA); 13 miles [c. 21 km] SSW [of] Borrooloola, Jun 1971, *Dunlop 2202* (DNA); SE of Calvert River mouth, Jan 1989, *Brock 446* (DNA). **Queensland.** COOK DISTRICT: Mapoon Beach, S of Port Musgrave, Dec 1980, *Morton AM1011* (BRI, MEL); Weipa, Nanam Beach, Jul 1980, *Morton AM767* (BRI); Lake Patricia, Weipa, Dec 1993, *Forster PIF14412* (BRI); Edward River Mission, Jun 1968, *Pedley 2690* (BRI). BURKE DISTRICT: 77 km N of Escott homestead by track, towards Point Parker. Jul 1987, *Dalliston HC251* (BRI); Sweers Island, South Wellesley Islands, southern Gulf of Carpentaria, Nov 2002, *Thomas SW13 & Pedley* (BRI); North Bountiful Island, South Wellesley Group, Gulf of Carpentaria, Nov 2002, *Thomas BO152 & Pedley* (BRI); 10 km W [of] Massacre Inlet, Wentworth Station, Dec 1984, *Thompson 855* (BRI).

Distribution and habitat: *Euphorbia mitchelliana* var. *filipes* occurs along the northern coast of Australia from Coburg Peninsula, NT, eastward to Weipa, Qld (**Map 30b**). It grows mostly in grassland, open woodland or on the edge of monsoon vine

thicket on sandy soils on coastal floodplain, dunes or beach ridges.

Phenology: Flowers and fruits have been collected throughout the year.

Typification: Bentham (1873) in his protologue of *E. filipes* states “N. Australia, Islands of the Gulf of Carpentaria, R. Brown, Henne; Fitzmaurice river, F. Mueller”. Four collections (K 186469, 186470, 186471, 186472) which are considered by us as syntypes of the name *E. filipes*, have been located amongst material of *Euphorbia* on loan to BRI from K. The collection (K 186472) is here selected as lectotype because it is part of the original material, has morphology that best matches the description in the protologue of this variety. All of the syntypes [K 186469, 186470, 186471, 186472] are referable to *E. mitchelliana* var. *filipes* as applied here.

Baillon (1866) cited two collections in his protologue of *Euphorbia alsiniflora* namely “N.? Bentink island (herb. Mus., ex herb. F. Muell.!). – Martin”, “Mount King, Glensly river (herb. F. Muell.!).”. Two collections (MEL 68196, P 313099) which are considered by us as syntypes of the name *E. alsiniflora*, have been located amongst material of *Euphorbia* on loan to BRI from MEL and P [a: Mount King, Glensly [Glenelg] River, [Dr. J.] Martin s.n. (MEL 68196); b: Bentink [Bentinck] Island, [without date or collector] (P 313099). The collection from Bentinck Island (P 313099) is here selected as lectotype because it is the more ample and best preserved of the syntypes and has morphology that best matches the description in the protologue of this species. In 1989, B.G. Thomson annotated the collection from Mount King, Martin s.n. [MEL 68196] as lectotype but this was not published. Due to the poor quality of the material and lack of seed we are unable to confidently identify the Martin s.n. [MEL 68196] collection. It is most likely referable to either *E. trigonosperma* or *E. biconvexa*.

Notes: *Euphorbia mitchelliana* var. *filipes* differs from the typical form by having larger involucre (0.8–1.2 × 1.2–1.5 mm versus 0.6–1 × 0.7–1 mm for *E. mitchelliana* var. *mitchelliana*), more staminate flowers per

cyathia (20–50 per cyathia versus 5–15 per cyathia for *E. mitchelliana* var. *mitchelliana*) and larger gland appendages (0.5–1.5 × 1.1–2.2 mm versus 0.1–0.6 × 0.5–0.6 mm for *E. mitchelliana* var. *mitchelliana*). For features distinguishing *Euphorbia mitchelliana* var. *filipes* from *E. mitchelliana* var. *longiloba* see the ‘Notes’ section under that variety.

30c. *Euphorbia mitchelliana* var. *longiloba* Halford & W.K.Harris, **varietas nova** ab *E. mitchelliana* Boiss. var. *mitchelliana* involucre majore 1–1.3 × 1.2–1.8 mm (ad vicem involucre 0.6–1 × 0.7–1 mm longo) floribus staminatis pluribus 35–50 in quoque cyathio) ad vicem floribus 5–15 in quoque cyathio) appendicibus glandulae plerumque majoribus 0.5–1.5 × 0.5–1.7 mm (ad vicem appendicibus 0.1–0.6 × 0.5–0.6 mm) necnon ab *E. mitchelliana* var. *filipedi* (Benth.) Halford & W.K.Harris foliis linearibus usque angusto-oblongis vel angusto lanceolatis 5.5–20 plo longioribus quam latioribus (ad vicem foliis ovatis ellipticis usque oblongo-ellipticis 1.5–4.5(6) plo longioribus quam latioribus) differt. **Typus:** Northern Territory, 40 km W [of] Seven Emus, 22 January 1989, B.G.Thomson 2948 (holo: BRI, according to label information on the holotype sheet there are duplicates (isotypes) lodged at DNA n.v., NT n.v.).

Euphorbia pubicaulis S.Moore, *J. Bot.* 64: 97 (1926). **Type:** [Northern Territory.] Groote Eylandt, March 1925, G.H.Wilkins 175 (holo: BM 812173).

Herbaceous perennial to 80 cm high, with many stems arising from woody rootstock. **Stems** erect to ascending (rarely prostrate or rhizomatous), glabrous (rarely sparsely hairy). **Leaf blade** linear to narrow-oblong, or narrow-lanceolate, 14–45 mm long, 2–7 mm wide, 5.5–20 times longer than wide; both surfaces glabrous (rarely sparsely hairy); margin entire or minutely serrulate distally with gland-tipped teeth; apex acute. **Involucres** campanulate, 1–1.3 mm long, 1.2–1.8 mm across; glands 0.1–0.5 mm long, 0.3–0.8 mm wide; gland appendages conspicuous, broad-obovate, obdeltoid, 0.5–1.5 mm long, 0.5–1.7 mm wide, pink or white, margin entire or shallowly lobed. **Staminate flowers** 35–50

per cyathium. **Capsules** glabrous. $n = 8$.

Additional selected specimens examined: **Western Australia.** Dillon's Spring, Oct 1906, *Fitzgerald s.n.* (NSW 612843). **Northern Territory.** North Goulburn Island, Apr 1995, *Booth 808* (DNA); Tin Camp Creek, Nov 1991, *Brennan 1635* (DNA); 24 miles [c. 38 km] E [of] OT Downs homestead, Mar 1959, *Chippendale 5527* (BRI, DNA, MEL, NSW); Mooroonga Island, Garmalatjirra Outstation, Aug 1995, *Cowie 5967* (DNA); 10 km S of Roper River mouth, Nov 1987, *Dunlop 7364* (DNA); Allia Creek, Feb 1989, *Dunlop 7967 & Leach* (BRI, MEL); 25 km E [of] Bulman, Arnhem Land, Jun 1990, *Dunlop 8657 & White* (AD, BRI, MEL); Banyella, Blue Mud Bay, May 1993, *Dunlop 9419 & Leach* (DNA); 15 km S of Elliott, Jan 1993, *Egan 1349* (DNA); N of Nhulunbuy, Oct 1993, *Egan 2698* (BRI, DNA); Nhulunbuy, mine rehabilitation site, Feb 1982, *Hinz s.n.* (BRI [AQ512374], DNA [D0051128], MEL 1583977); c. 40 km SSW of Nathan River homestead, Aug 1985, *Latz 10104* (AD, DNA); 7 miles [c. 11 km] NE of Legune Station, Jul 1949, *Perry 2585 & Lazarides* (BRI, DNA, MEL); Sir Edward Pellew Islands, West Island, Jan 1989, *Russell-Smith 6742 & Lucas* (MEL); Boomerang Creek, Merlin Mining Lease, Apr 1996, *Smith 3810* (DNA); 40 km NNW [of] Wologorang homestead, Jan 1989, *Thomson 3021* (DNA). **Queensland.** COOK DISTRICT: Wenlock, Batavia River, Jul 1948, *Brass 19689* (BRI); 13.6 km W of the track from Rutland Plains to Inkerman on the track to White Waterhole, May 1992, *Clarkson 9538 & Neldner* (BRI). BURKE DISTRICT: Westmoreland, off road past Hells Gate, May 1997, *Forster PIF21071 & Booth* (BRI); 169 km S of Normanton, May 1976, *Hassall 7636* (BRI).

Distribution and habitat: *Euphorbia mitchelliana* var. *longiloba* occurs from near Wyndham WA, through northern NT to the Qld border, with scattered occurrences on Cape York Peninsula, Qld (**Map 30c**). It grows in eucalypt woodland or open forest communities on hills or plains on mostly sandy soils, also recorded growing on coastal sand dunes.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia mitchelliana* var. *longiloba* resembles the typical form in leaf size and shape but differs from the that by having larger involucre (1–1.3 × 1.2–1.8 mm versus 0.6–1 × 0.7–1 mm for *E. mitchelliana* var. *mitcheiliana*), more staminate flowers per cyathia (35–50 per cyathia versus 5–15 per cyathia for *E. mitchelliana* var. *mitcheiliana*) and generally larger gland appendages (0.5–1.5 × 0.5–1.7 mm versus 0.1–0.6 × 0.5–0.6 mm for *E. mitchelliana* var. *mitcheiliana*).

Euphorbia mitchelliana var. *longiloba* differs from *E. mitchelliana* var. *filipes* by having leaves linear to narrow-oblong, or narrow-lanceolate, that are 5.5–20 times as long as wide (versus leaves ovate, elliptic to oblong-elliptic, 1.5–4.5(6) times as long as wide for *E. mitchelliana* var. *filipes*).

Etymology: The varietal epithet is from Latin *longus*, long, and *lobus*, lobe, in reference to the longer gland appendages of this variety compare to the gland appendages of the type variety.

31. *Euphorbia muelleri* Boiss., in A.DC., *Prodr.* 15(2): 27 (1862). **Type:** [Northern Territory.] tropical Australia, *s.d.*, *F. Mueller s.n.* (holo: K 186485; iso: P 698540 *n.v.* (image seen)).

Illustration: Dunlop *et al.* (1995: 218, fig. 72).

Monoecious (rarely dioecious), herbaceous perennial, few to many annual stems arising from thickened woody rootstock. **Stems** prostrate (rarely erect, *Leach 3258* [DNA]), smooth, glabrous or with a sparse to dense indumentum; hairs spreading, straight, 0.1–0.3 mm long, white. **Interpetiolar stipules** narrow-triangular to broad-triangular, 0.4–1.5 mm long, entire, bifid to deeply bipartite, glabrous or hairy abaxially with hairs as for stems; margin entire or lacerate with gland-tipped teeth. **Leaves:** petiole 0.4–2 mm long, smooth, glabrous or with indumentum as for stems; blade ovate to broad-ovate or elliptic to rotund, (4) 9–20 (27) mm long, (3) 7–16 (18) mm wide, 1–1.4 times longer than wide; adaxial surface green occasionally with reddish tinge, smooth, glabrous (rarely with indumentum as for abaxial surface); abaxial surface pale green or red, smooth, mostly with a sparse to moderately dense indumentum consisting of spreading, straight hairs to 0.2 mm long (rarely glabrous); base asymmetric with one side rounded to shallowly cordate, the other obtuse or rounded; margin entire; apex rounded to obtuse or retuse. **Cyathia** solitary at the nodes; peduncles 3–11 mm long, smooth, glabrous or with indumentum as for stems. **Involucre** cupuliform to turbinate, 1.5–2.5 mm long, 1.7–2.8 mm across; lobes 5, triangular, 0.7–1.4 mm long, margin entire or

ciliate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong or reniform in outline, 0.3–0.6 mm long, 0.8–1.5 mm wide, colour unknown; gland appendages conspicuous, spreading radially, elliptic, broad-obovate to very broad-obovate or transverse-oblong, 0.6–1.5 mm long, 1.3–3.5 mm wide, white, glabrous, margin entire or shallowly lobed; bracteoles 1.7–2 mm long, adnate for c. 1/2 of their length to involucre, free portion deeply divided into numerous subulate hirsute segments. **Staminate flowers** 50–60 per cyathium; pedicels 2.1–2.5 mm long; staminal filaments 0.4–0.6 mm long. **Pistillate flowers:** styles 0.8–1 mm long, ascending, spreading distally, smooth, glabrous, each bifid for c. 1/2 of their length, the apices clavate. **Capsules** exerted from involucre on pedicel to 10 mm long, transversely broad-elliptic in lateral view, 2.8–3.5 mm long, 3.5–3.8 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous or sparsely hairy; hairs spreading, to 0.2 mm long; hypogynous disc entire. **Seeds** ovate or broad-ovate in outline, 1.9–2.7 mm long, 1.6–2 mm tangentially, 1.5–1.9 mm radially, tetragonous in cross section; dorsal faces convex; ventral faces \pm planar; all faces with faint narrow irregular ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta brown. **Fig. 26Q.**

Additional selected specimens examined: **Northern Territory.** Finnis River Road to Litchfield N.P., Sep 1992, *Leach 3258* (DNA); Lowther Road, Virginia, Nov 1984, *Wightman 1769* (DNA); Howard River floodplain, E side of Gunn Point Road, Mar 2001, *Cowie 9059* (BRI); 8 miles [c. 13 km] NE [of] Humpty Doo, Jun 1972, *McKean B550* (DNA); Shoal Bay Road, Aug 1973, *Parker 144* (DNA); Koongarra area, Apr 1979, *Rankin 2026* (DNA); Muirella Park, Kakadu N.P., Dec 1980, *Dunlop 5623* (DNA); 2 km N of Nabarlek airstrip, Apr 1979, *Rankin 2211* (DNA); Nabarlek, Nov 1988, *Hinz 56* (DNA); c. 7 km S of Daly River Road from Blackfellow Creek crossing, Tipperary Station, Aug 1986, *Strong 925* (DNA); 1.5 km W [of] Wangi Falls, Oct 1984, *Sivertsen 972* (DNA); Daly River Mission area, Mar 1993, *Wightman 6024* (DNA); Litchfield N.P., Lost City Road, Mar 1994, *Egan 3358* (DNA); Litchfield Park, Jun 1998, *Michell & Risler 1588* (DNA); 11.2 miles [c. 18 km] S [of] Batchelor, Mar 1961, *Chippendale 7728* (DNA, MEL, NSW); 2 km N of Hayes Creek, Nov 1987, *Smith 890* (DNA); Kakadu N.P., 6 km E of South Alligator River, Old Darwin road, Nov 1986, *Cowie 432* (DNA); 35 km SSW of Cooida on Pine Creek Road,

May 1980, *Craven 5602* (DNA); Mann River; c. 5 km S [of] headwaters, Jun 1992, *Wilson 1451* (DNA); Kakadu Highway, 600 m from Pine Creek Road junction, Nov 1991, *Brennan 1618* (DNA).

Distribution and habitat: *Euphorbia muelleri* is restricted to the northern part of the NT, from the Finnis River area, east to Nabarlek (**Map 31**). It grows in eucalypt woodland/open forest or *Melaleuca* woodland communities on mostly sandy soils on rocky ridges, hillslopes or plateaux.

Phenology: Flowers and fruits have been collected in March, April, June and from August to December.

Notes: *Euphorbia muelleri* is a distinctive species that bears a general resemblance to *E. pallens* but differs from it by having larger seeds, capsules and cyathia, longer gland appendages, more staminate flowers per cyathia, seed surface with faint narrow irregular ridges and cyathia solitary at the nodes. It also grows in a different habitat.

32. *Euphorbia multifaria* Halford & W.K.Harris, **species nova** habitu generali glandulis involucri et glandulae appendicibus arcte similis *E. verrucitestae* Halford & W.K.Harris sed capsulis majoribus lato-ellipticis 1.5–1.7 \times 1.5–2.1 mm (ad vicem capsulis perlato-ovatis 1.3–1.5 \times 1.5–1.7 mm) seminum superficiebus laevibus vel leviter irregulariter porcatis (ad vicem superficiebus verrucis irregularibus in seminis superficiebus ornatis) differt. Aliquae formae similis *E. ferdinandi* Baill. sed ab ea distinguendae seminibus latioribus 1.1–1.4 \times 0.7–0.8 mm (ad vicem seminibus 1.1–1.6 \times 0.5–0.7 mm) capsulis lato-ellipticis latis quam latioribus 1.5–1.9 \times 1.5–2.1 mm (ad vicem ellipticis latis quam manifeste longioribus). *Euphorbia multifaria* quondam eadem atque *E. drummondii* Boiss. considerata est sed habitu plerumque minori seminum superficiebus laevibus vel porcatis leviter irregulariter (ad vicem superficiebus 3–6 porcis distinctis transversis) differt. **Typus:** South Australia. c. 27 km N of Kingoonya, 7 September 1966, *N.N.Donner 1684* (holo: AD).

Monoecious, annual or herbaceous perennial with thickened rootstock, to 10 cm high, many stems arising from base, the whole plant

glabrous. **Stems** prostrate (rarely ascending to erect), smooth or often longitudinally ridged. **Interpetiolar stipules** triangular, 0.3–1 mm long, deeply bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.2–0.6 mm long, smooth; blade oblong, obovate, oblong-obovate or elliptic, 2.8–7 mm long, 1.6–3.8 mm wide, 1.8–1.9 times longer than wide; adaxial surface dull light blue-green often with reddish patches along the midline, smooth (rarely minutely papillose); abaxial surface green, smooth; base asymmetric with one side rounded to shallowly cordate, the other obtuse to cuneate; margin sparingly minutely toothed; apex rounded. **Cyathia** solitary at the nodes, sometimes clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.3–0.4 mm long, smooth. **Involucres** campanulate or turbinate, 0.5–0.6 mm long, 0.6–0.8 mm across; lobes 5, triangular, 0.3–0.5 mm long, margin fimbriate; glands 4, stipitate, cupuliform, with distinct central pit and thickened rim, transverse-oblong or orbicular in outline, 0.1–0.3 mm long, 0.2–0.4 mm wide, red; gland appendages inconspicuous, spreading radially, transverse-linear, <0.1 mm long, c. 0.1 mm wide, pink, glabrous, margin entire; bracteoles 0.5–0.8 mm long, adnate for c. 1/5 of their length to involucre, free portion divided into few subulate glabrous or hirsute segments. **Staminate flowers** 4–10 per cyathium; pedicels 0.7–1 mm long; staminal filaments c. 0.2 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, erect to ascending, smooth, glabrous, each entire to scarcely bifid or bifid for 1/3–1/2 of their length, the apices stout. **Capsules** exserted from involucre on pedicel to 2.7 mm long, broad-elliptic in lateral view, 1.5–1.9 mm long, 1.5–2.1 mm across, shallowly 3-lobate with keels obtuse, smooth (rarely minutely papillose), glabrous; hypogynous disc entire (rarely lacinate). **Seeds** ovate in outline, 1.1–1.4 mm long, 0.7–0.8 mm tangentially, 0.6–0.7 mm radially, tetraquetrous in cross section; dorsal faces planar or concave; ventral faces concave; all faces smooth or with faint narrow irregular ridges; exotesta of even thickness over surface or sometimes thicker on ridges,

microreticulate or microgranulate, grey-white or pale brown, becoming mucilaginous when moistened; endotesta pale brown to red-brown. $n = 11$. **Figs 13, 26R, 27A.**

Additional selected specimens examined: **Western Australia.** 16.2 km W along road to Weano Gorge from Yampire Gorge to Juna Downs Road, Hamersley Range N.P., Jun 1989, *Trudgen 7000* (PERTH); Lake Mason Station, Jul 1941, *Bennett 3* (PERTH); Queen Victoria Spring, Mar 1992, *Pearson DJP1778* (PERTH); 6 km S of Mundrabilla Hotel, Sep 1984, *Downing 987* (PERTH); c. 16 km S of Norseman, Apr 1999, *Davis 8807* (PERTH); 44 km NE of Balladonia, Mar 1984, *Keighery 7328* (PERTH); 20.9 km S of Caiguna via Baxter's Memorial track, Aug 1983, *Fitzgerald s.n.* (PERTH 02846934). **Queensland.** WARREGO DISTRICT: 46 km SE [of] Charleville along Boatman Road, Mar 1976, *Purdie 87 & Boyland* (BRI); c. 10 miles [c. 16 km] N of Hungerford, May 1973, *Hassall 7331* (BRI). **South Australia.** 12 km S of Nefertiti Gate, Mobella Station, Sep 1995, *Badman 8146* (AD); 6 km W of Roxby Downs, Apr 1989, *Badman 2073* (AD); Knowles Cave, Nullarbor Plain, Feb 1967, *Symon 4648* (AD, NSW); Eyre Peninsula, Yudnapinna, Jul 1966, *Rogers 460* (AD); Koonamore Vegetation Reserve, 60 km N of Yunta, Jun 1968, *Carrick 1688* (AD, HO, MEL); c. 5 km ex Yunta on Waukaringa Road, Mar 1968, *Barker 252* (AD); Quondong, KiKi – Lilydale fence, Apr 1967, *Barker 24* (AD). **New South Wales.** Fowlers Gap, N of Broken Hill, Oct 1975, *Jacobs 2102* (NSW); 10.6 km NE of 'Glenoca' homestead, on road to 'Boorongie' homestead, 26 km NE of Little Topan Hotel, Oct 1971, *DeNardi 881* (NSW); 29 miles [c. 47 km] by road NNW of Wilcannia, on road to White Cliffs, May 1969, *Briggs 2709* (NSW); API Gypsum Mine, 'Marlow', 23 km NNW [of] Conoble Railway Station, Mar 1973, *Pickard 1944* (NSW); near Darling River, 16 km NNE of Wentworth and 2 km S of Tapio Station, Aug 1978, *Muir 5837* (MEL). **Victoria.** Meridian Road, 13 km S of Benetook, Sep 1981, *Corrick 7409* (AD, MEL).

Distribution and habitat: *Euphorbia multifaria* is widespread in southern Australia from near Narrogin and Mount Magnet, WA, east through southern SA, north-western Vic and western NSW to near Mitchell, in southern Qld, with an outlier population in the Hamersley Range, north-western WA (**Map 32**). It commonly grows in shrubland or woodland communities on sandy soils on undulating plains or on aeolian dunes. It is also recorded on shallow soils on rocky slopes or outcrops, and in chenopod shrubland communities on clay soils on flats.

Phenology: Flowers and fruits have been collected throughout the year.

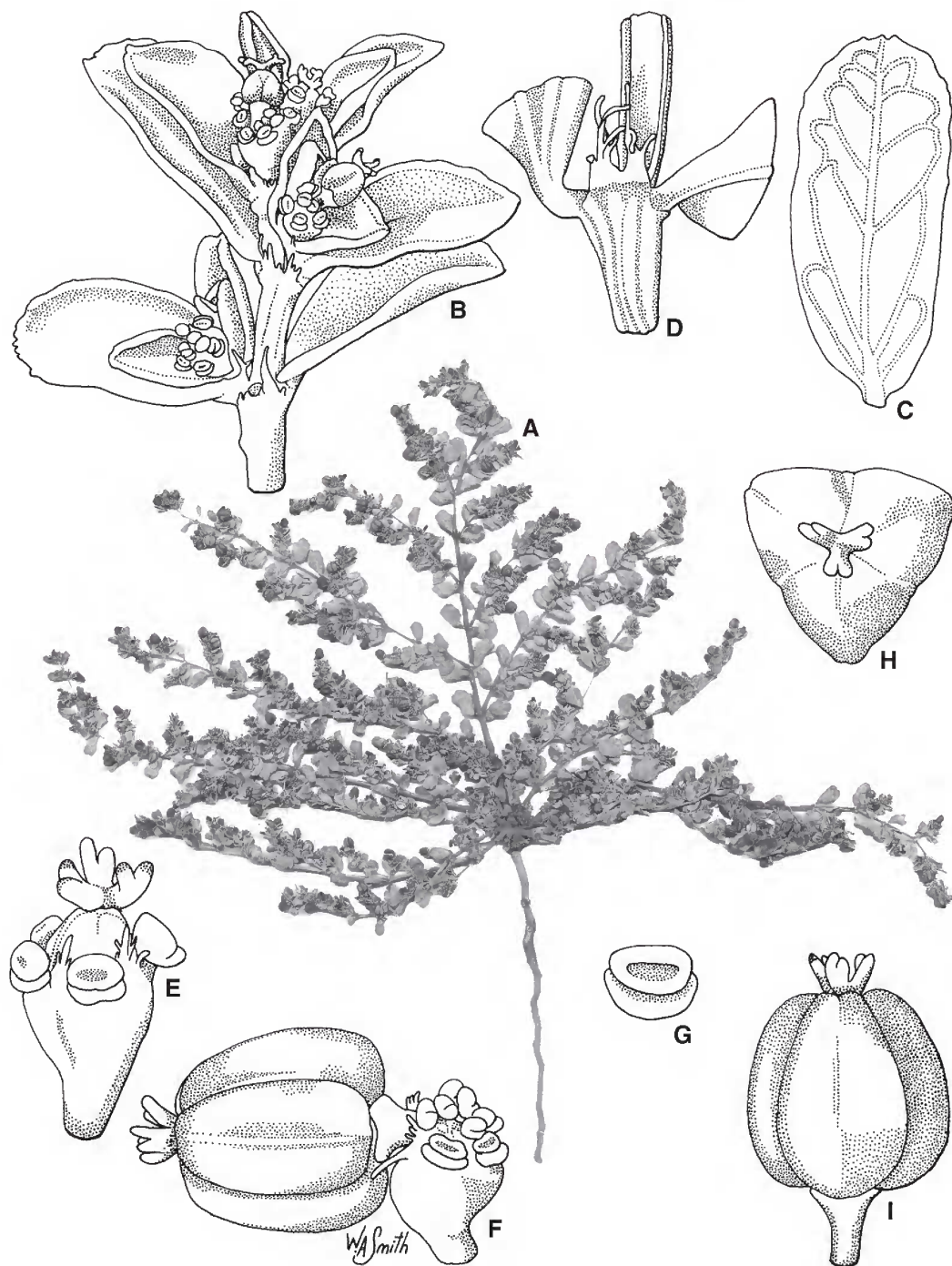


Fig. 13. *Euphorbia multifaria*. A. habit $\times 1$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. stipules $\times 16$. E. cyathia with female flower $\times 24$. F. cyathia with capsule $\times 16$. G. cyathial gland with appendage, adaxial view $\times 24$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A from Barker 24 (AD); B–I from Donner 1684 (AD). Del. W.Smith.

Notes: *Euphorbia multifaria* is very similar to *E. verrucitesta* in its general habit, involucre glands and gland appendages. It differs from *E. verrucitesta* by its larger broad-elliptic capsules, $1.5\text{--}1.9 \times 1.5\text{--}2.1$ mm (versus capsules very broad-ovate, $1.3\text{--}1.5 \times 1.5\text{--}1.7$ mm for *E. verrucitesta*) and smooth or faintly irregularly ridged seed surfaces (versus irregular wart-like protuberances on the seed surface for *E. verrucitesta*).

Some forms of *E. multifaria* resemble *E. ferdinandi* but can be distinguished from that species by its broader seeds ($1.1\text{--}1.4 \times 0.7\text{--}0.8$ mm versus $1.1\text{--}1.6 \times 0.5\text{--}0.7$ mm for *E. ferdinandi*) and broad-elliptic capsules that are as long as wide, $1.5\text{--}1.9 \times 1.5\text{--}2.1$ mm (versus capsules elliptic, $1.4\text{--}2.1 \times 1.2\text{--}1.7$ mm, that are distinctly longer than wide for *E. ferdinandi*).

Euphorbia multifaria has been previously identified as *E. drummondii* but differs from that species by having smooth or faintly irregular ridged seed surfaces (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*) and generally smaller habit.

As recognised here *Euphorbia multifaria* is a morphologically variable complex and with further collections and study may be subdivided into a number of taxa. One of the more recognisable variants has the seed surface faintly irregularly ridged with a chalky grey-white endotesta (**Fig. 27A**). This form has been recorded from Norseman, WA east across the Nullarbor Plain to Immarna Siding, SA (e.g. *Davis 8807*, *Keighery 7328*, *Symon 4648*). The more typical observed seed surface is smooth or faintly undulate (**Fig. 26R**) which is found throughout the species range.

Etymology: The specific epithet is from Latin, *multifarius*, having great variety, and is in reference to the variation of this species seed surface texture, and style architecture.

33. *Euphorbia myrtoides* Boiss. in A.DC., *Prodr.* 15(2): 15 (1862); *Chamaesyce myrtoides* (Boiss.) D.C. Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Western Australia.] Despard [Depuch?] Island, *s.d.*, [*B.*] Bynoe *s.n.* (holo: K 186487; iso: BM *n.v.* [image seen]).

Monoecious, herbaceous perennial 10–40 cm high, few to many stems arising from woody rootstock, the whole plant glabrous. **Stems** ascending to erect (rarely prostrate), sparingly to much branched, smooth. **Interpetiolar stipules** subulate or triangular, 0.3–1 mm long, bipartite, glabrous; margin lacinate or lacerate. **Leaves:** petiole 0.5–2.5 mm long, smooth; blade ovate, obovate, oblong or oblong-elliptic, 5–17 mm long, 3–9 mm wide, 1.5–2 times longer than wide; adaxial surface bright green or yellow-green, smooth; abaxial surface pale green or grey-green, smooth; base asymmetric with one side cordate, the other obtuse to rounded; margin entire or serrulate to serrate; apex rounded. **Cyathia** solitary at the distal nodes, sometimes clustered on short leafy lateral branchlets with subtending leaves slightly smaller than the primary stem leaves; peduncles 0.5–2.5 mm long. **Involucres** cupuliform, 0.8–1.1 mm long, 0.8–1.5 mm across; lobes 5, narrow-triangular to broad-triangular, 0.3–0.5 mm long, margin entire or fimbriate; glands 4, stipitate, patelliform, planar or concave, transverse-elliptic to reniform in outline, 0.3–0.6 mm long, 0.4–1.2 mm wide, yellow, yellow-green or red; gland appendages absent or conspicuous, spreading radially, transverse-oblong, 0.1–0.6 mm long, 1–1.3 mm wide, white, pink or red, glabrous, margin entire or dentate to shallowly lobed; bracteoles 1–1.2 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into few to numerous subulate glabrous or hirsute segments. **Staminate flowers** 12–30 per cyathium; pedicels 1.1–1.5 mm long; staminal filaments 0.1–0.4 mm long. **Pistillate flowers:** styles 0.5–0.9 mm long, connate at the base into a column for *c.* 1/5 of their length, spreading, smooth, glabrous, each bifid for 1/4–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 4.5 mm long, elliptic to broad-elliptic in lateral view, 2.2–2.8 mm long, 2.2–2.6 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, $(1.3)1.5\text{--}2$ mm long, 0.8–1.1 mm tangentially, 0.8–1.1 mm radially, tetraquetrous in cross section; dorsal faces planar or convex; ventral faces planar to concave; all faces with faint to prominent

narrow irregular ridges; exotesta thin, of even thickness over surface, white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta brown. **Fig. 27B.**

Additional selected specimens examined: Western Australia. Pender Bay, Dampierland, 4.5 km NE [of] Cape Borda, Mar 1989, *Keighery 10573* (PERTH); 1 km from Port Smith camping area, Port Smith, Apr 1992, *Zich 154* (MEL, NSW); 1 km W of Mandora Station homestead, Aug 1997, *Mitchell PRP1779* (BRI, PERTH); 21 km NE of Sandfire Roadhouse, Great Northern Highway, Sep 1978, *Beaglehole ACB59327 & Errey* (PERTH); N of Dragon Tree Soak, Great Sandy Desert, Aug 1977, *George 14770* (PERTH); Back Beach, Karratha, July 1981, *Craig 265* (PERTH); Onslow, Feb 1985, *Dodd 171 & Madin* (PERTH); Onslow, Sep 2006, *Halford Q9294* (BRI); near Thels Well, Mardie Station, Aug 2002, *Thompson JPS164* (PERTH); near Lakes Percival and Wooloomba, Aug 1962, *Johnson s.n.* (DNA D9762); Tobin Lake, Great Sandy Desert, May 1979, *George 15641* (PERTH); near Norcape Lodge, Exmouth, Jul 1977, *McFarland s.n.* (BRI [AQ234287]); near S boundary of Cane River Station, 80 km SE of Onslow, May 1999, *Edinger 1495* (PERTH); Lake Auld, July 1967, *George 9144* (PERTH); Kennedy Range N.P., 30 km NE of Binthalya, Aug 1994, *Keighery & Gibson 1518* (PERTH); Muggon Station, N boundary of Spinifex Paddock, 3.7 km W of Spinifex Well, Sep 1999, *Patrick 3202 et al.* (PERTH); Cape Boileau, 35 km N [of] Broome, May 1991, *Thomson 3497* (DNA); Port Hedland, May 1991, *Thomson 3665* (DNA); Anketell Ridge, Great Sandy Desert, May 1979, *Mitchell 1160* (DNA).

Distribution and habitat: *Euphorbia myrtilloides* occurs in north-western WA from Carnarvon to Derby and inland to the Great Sandy Desert (**Map 33**). It grows in open shrubland, or *Spinifex/Triodia* grassland communities on crests or upper slopes of coastal beach dunes and inland sand dunes.

Phenology: Flowers and fruits have been collected throughout the year, particularly from April to September.

Notes: The holotype at Kew has a label with hand written annotation in ink “Euphorbia, Despard Island, NW. Aust., Bynoe”. This locality appears to be erroneous. There is no record of an island of this name along the WA coast. Benjamin Bynoe was the surgeon on the voyage of the Beagle (1837–1843). Hall (1978) noted that Bynoe chiefly collected at Depuch Island and in the Abolhos in north-western Australia. Depuch Island is the most likely collection site for the type specimen. The isotype in the BM has a printed label

“VOYAGE OF H.M.S. BEAGLE, 1839–40 PRESENTED 1842” with a hand annotation “Depuch Island, Bynoe Coll., Cpts. Wickham & Stokes”.

There is variation in the prominence and degree of seed surface sculpturing and habit, but the variation grades from one form to another form.

Euphorbia myrtilloides is morphologically most similar to *E. wheeleri* but can be distinguished from that by its faint to prominent narrow irregular ridges on the seed surface (versus foveate to reticulate-foveate seed surface for *E. wheeleri*).

Some of the southern populations of *Euphorbia myrtilloides* approach *E. sharkoensis* in general facies; however, it can be distinguished from that species by its generally larger capsules and seeds.

34. *Euphorbia obliqua* Endl., Prodr. Fl. Norfolk. 85 (1833); *Chamaesyce obliqua* (Endl.) J. Florence, *Bull. Mus. Natl. Hist. Nat., B, Adansonia*, 18(3–4): 241 (1996). **Type:** Norfolk Island, *s.d.*, *F.L. Bauer s.n.* (holo: W n.v.).

Illustrations: Green (1993: 315, fig. 2, B1–3; 1994: 236, fig. 47, E–G).

Monoecious, herbaceous perennial, many stems arising from thickened woody rootstock. **Stems** prostrate, sparingly to much branched, smooth, glabrous. **Interpetiolar stipules** triangular to broad-triangular, 0.6–1 mm long, entire or bifid, glabrous abaxially, hairy adaxially with appressed hairs c. 0.1 mm long; margin dentate. **Leaves:** petiole 1–2 mm long, smooth; blade elliptic to broad-elliptic, 9–20 mm long, 6–10 mm wide, 1.2–1.8 times longer than wide; adaxial surface green to blue-green, smooth, glabrous, abaxial surface pale blue-green, smooth, glabrous, base asymmetric with one side cordate, the other obtuse to rounded or cordate; margin entire; apex obtuse to rounded. **Cyathia** solitary at the distal nodes; peduncles 2–3 mm long. **Involucres** turbinate, 1.3–2 mm long, 1–1.5 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin entire or lacinate; glands 4, stipitate, patelliform, ± planar, transverse-oblong in outline, 0.3–0.4 mm long, 0.6–0.7

mm wide, yellowish green; gland appendages conspicuous, spreading radially, transverse-linear or lunate, c. 0.1 mm long, 0.6–0.9 mm wide, white, glabrous, margin entire; bracteoles 1.3–1.5 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into numerous subulate hirsute segments. **Staminate flowers** 15–25 per cyathium; pedicels 1.1–1.6 mm long; staminal filaments 0.5–0.6 mm long. **Pistillate flowers:** styles 0.5–0.6 mm long, connate at the base into a column for c. 1/8 of their length, spreading, smooth, glabrous, each bifid for 1/2–2/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 4 mm long, very broad-ovate or transversely broad-elliptic in lateral view, 2.2–2.3 mm long, 2.5–3 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** very broad-elliptic in outline; 1.4–1.5 mm long; 1.2–1.4 mm tangentially, 1.2–1.3 mm radially, suborbicular in cross section; dorsal and ventral faces convex, smooth; exotesta thin, of even thickness over surface, chalky-white, microreticulate, not becoming mucilaginous when moistened; endotesta pale brown. **Fig. 27C.**

Additional selected specimens examined: Queensland.

NORTH KENNEDY DISTRICT: Holbourne Island, Great Barrier Reef, 39 km from Bowen, Mar 1971, *Heatwole s.n.* (BRI [AQ7736]); Hayman Island, Jun 1934, *White 10181* (BRI); Deloraine Island, Nov 1985, *Batianoff 3479 & Dalliston* (BRI). **SOUTH KENNEDY DISTRICT:** Penrith Island, 70 km E of Mackay, Nov 1986, *Batianoff 6040* (BRI). **PORT CURTIS DISTRICT:** North West Island, Aug 1968, *Baxter 977* (BRI); Masthead Island, May 1998, *Batianoff 980527* (BRI); Masthead Island, Great Barrier Reef, Capricorn Group, c. 56 km NE of Gladstone, Dec 1970, *Heatwole s.n.* (BRI [AQ6541]); Tryon Island, Great Barrier Reef, Capricorn Group, c. 106 km from Yeppoon, Aug 1971, *Heatwole s.n.* (BRI [AQ7777]); Capricorn Islands, Great Barrier Reef, Jan 1932, *Macgillivray s.n.* (BRI [AQ202444]); North West Island N.P., Great Barrier Reef Marine Park, May 2000, *Batianoff 205031* (BRI); North West Island, Aug 1979, *Nugent s.n.* (BRI [AQ454415]); Wilson Island, Great Barrier Reef, Capricorn Group, c. 91 km NE of Gladstone, Oct 1969, *Cameron s.n.* (BRI [AQ7790]); Wreck Island N.P., Great Barrier Reef Marine Park, May 2000, *Batianoff 205071* (BRI, NSW); Heron Island, Capricorn Group, Jun 1973, *Fosberg 55079* (BRI); Heron Island, Dec 1983, *Smith 834 & Heatwole* (BRI); Tryon Island, May 2000, *Batianoff 205042* (BRI); West Hoskyn Island N.P., May 2000, *Batianoff 205137* (BRI, NSW).

Distribution and habitat: In the Western Pacific *Euphorbia obliqua* occurs on Norfolk Island, Vanuatu and New Caledonia (Green 1994). In Australia it occurs along the east coast of Qld from Bowen to Gladstone on continental islands and coral cays of the Great Barrier Reef (**Map 34**). It grows on coastal sands on frontal beach dunes.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia obliqua*, *E. litticola*, *E. pallens* and *E. psammogeton* all grow in very similar sandy foreshore habitats along the north and east coast of Australia but are allopatric in their distributions.

Euphorbia obliqua can be confused with *E. psammogeton*. It differs from that by its smooth seeds (versus faint irregular narrow rounded ridges), smaller gland appendages, to 0.1 mm long (versus 0.2–0.4 mm long for *E. psammogeton*), and solitary cyathia (versus cyathia in dichasial cymes for *E. psammogeton*).

In Qld, in the past, *Euphorbia obliqua* has been confused with *E. pallens* (previously referred to by the name *E. atoto* G.Forst.). It differs from that by its more slender habit, cyathia solitary in upper axils (versus cyathia arranged in terminal or axillary lax to congested dichasial cymes for *E. pallens*) and generally smaller leaves (9–20 × 6–10 mm versus 24–35 × 11–22 mm for *E. pallens*).

35. *Euphorbia occulta* Halford & W.K.Harris, **species nova** similis aliquantum *E. careyi* F.Muell. a qua glandularum appendicibus erectis cuculliformibus (ad vicem appendicibus aut absentibus aut radialiter extendentibus) glandis involucribus cupuliformibus lacuna centrali instructis (ad vicem appendicibus patelliformibus planis vel leviter concavis) bracteis involucribus obovatis (ad vicem bracteis oblongis usque triangularibus distinguenda. **Typus:** Queensland. **BURKE DISTRICT:** 12.3 km along Lake Moondara Road from Barkly Highway, N of Mt Isa, 1 July 2011, *D.Halford QM524A* (holo: BRI, iso: DNA, K, MEL, MICH, NT, distribuendi).

Diocious, herbaceous perennial to 20 cm high, with many stems arising from woody rootstock. **Stems** decumbent to erect, much branched, smooth, with moderately dense to dense indumentum; hairs spreading, straight, to 0.1 mm long, white. **Interpetiolar stipules** triangular, *c.* 0.1 mm long, bifid or deeply bipartite, with indumentum as for stems; margin \pm entire. **Leaves:** petiole 0.5–1 mm long, smooth, with indumentum as for stems; blade elliptic to broad-elliptic or \pm rotund, 4–5 mm long, 2.8–5 mm wide, 1.2–1.5 times longer than wide; adaxial surface yellow-green, smooth, with moderately dense indumentum consisting of spreading, straight, hairs to 0.1 mm long; abaxial surface yellow-green, minutely papillose, with indumentum as for adaxial surface; base asymmetric with one side cordate to obtuse, the other rounded; margin sparingly serrulate distally; apex rounded to retuse. **Cyathia** solitary at the nodes; peduncles 0.2–0.5 mm long. **Involucres** turbinate, 0.7–1 mm long, *c.* 1 mm across; lobes 5, obovate, 0.8–1 mm long, margin lacinate distally; glands 4, sessile, cupuliform, with distinct central pit, transverse-oblong in outline, *c.* 0.1 mm long, 0.4–0.5 mm wide, yellow; gland appendages conspicuous, erect, transverse-oblong, 0.3–0.5 mm long, 0.7–0.9 mm wide, yellow, glabrous, margin irregularly lobed distally; bracteoles 1.3–1.5 mm long, adnate for *c.* 1/3 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** *c.* 20 per cyathium; pedicels *c.* 0.8 mm long; staminal filaments *c.* 0.3 mm long. **Pistillate flowers:** styles 0.7–1.2 mm long, connate at the base into a column for *c.* 1/4 of their length, erect to spreading and slightly recurved distally, smooth, sparsely hairy, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 1.5 mm long, broad-elliptic or transversely broad-elliptic in lateral view, 2–2.5 mm long, 2–2.6 mm across, shallowly 3-lobate with obtuse keels, smooth, with moderately dense indumentum; hairs spreading, *c.* 0.1 mm long; hypogynous disc entire. **Seeds** ovate in outline, 1.3–1.5 mm long, 0.7–0.8 mm tangentially, 0.8–0.9 mm radially, tetragonous in cross section;

dorsal faces \pm planar; ventral facet concave; all faces with distinct rounded irregular ridges; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown. **Figs 14, 27D.**

Additional specimens examined: Queensland. BURKE DISTRICT: 12.3 km along Lake Moondara Road from Barkly Highway, N of Mt Isa, Jul 2011, *Halford QM524B* (BRI, DNA, MEL, MICH); Rifle Creek Station, S of Mt Isa, May 2005, *Booth 3536 & Kelman* (BRI); Rifle Creek, S of Mt Isa, May 2005, *Booth 3536A & Kelman* (BRI); 10.6 km ENE of Rifle Creek Dam, Aug 2001, *Kelman & Kelman s.n.* (BRI [AQ641966]); Rifle Creek Station, 8 km ENE of Rifle Creek Dam, Apr 2002, *Kelman s.n.* (BRI [AQ729647]).

Distribution and habitat: *Euphorbia occulta* is known only from the rocky hills in the vicinity of Mt Isa, north-western Qld (**Map 35**). It grows in low open woodland of *Eucalyptus leucophloia* Brooker and *Corymbia aparrerinja* K.D.Hill & L.A.S.Johnson with a ground layer usually dominated by tussock grasses or *Triodia pungens* on stony skeletal loam soils.

Phenology: Flowers and fruits have been collected in May, July and August.

Notes: *Euphorbia occulta* somewhat resembles *E. careyi* from which it can be distinguished by its erect hood-like gland appendages (versus gland appendages spreading radially or absent for *E. careyi*), cupuliform involucre glands with distinct central pit, (versus patelliform with planar or shallowly concave for *E. careyi*), and obovate involucre bracts (versus \pm oblong to triangular for *E. careyi*).

Etymology: The specific epithet is from Latin, *occultus*, secret, hidden, in reference to the concealment of the involucre glands by the erect hood-like gland appendages of this species.

36. Euphorbia ophiolitica (P.I.Forst.) Y.Yang, *Taxon* 61: 783 (2012); *Chamaesyce ophiolitica* P.I.Forst., *Austrobaileya* 5: 711–712 (2000). **Type:** Queensland. PORT CURTIS DISTRICT: First Sugarloaf, 9.5 km W of Canoona, 1 March 1994, *P.I.Forster PIF15042 & A.R.Bean* (holo: BRI; iso: AD *n.v.*, DNA *n.v.*, MEL *n.v.*, *fide* Forster [2000: 711]).

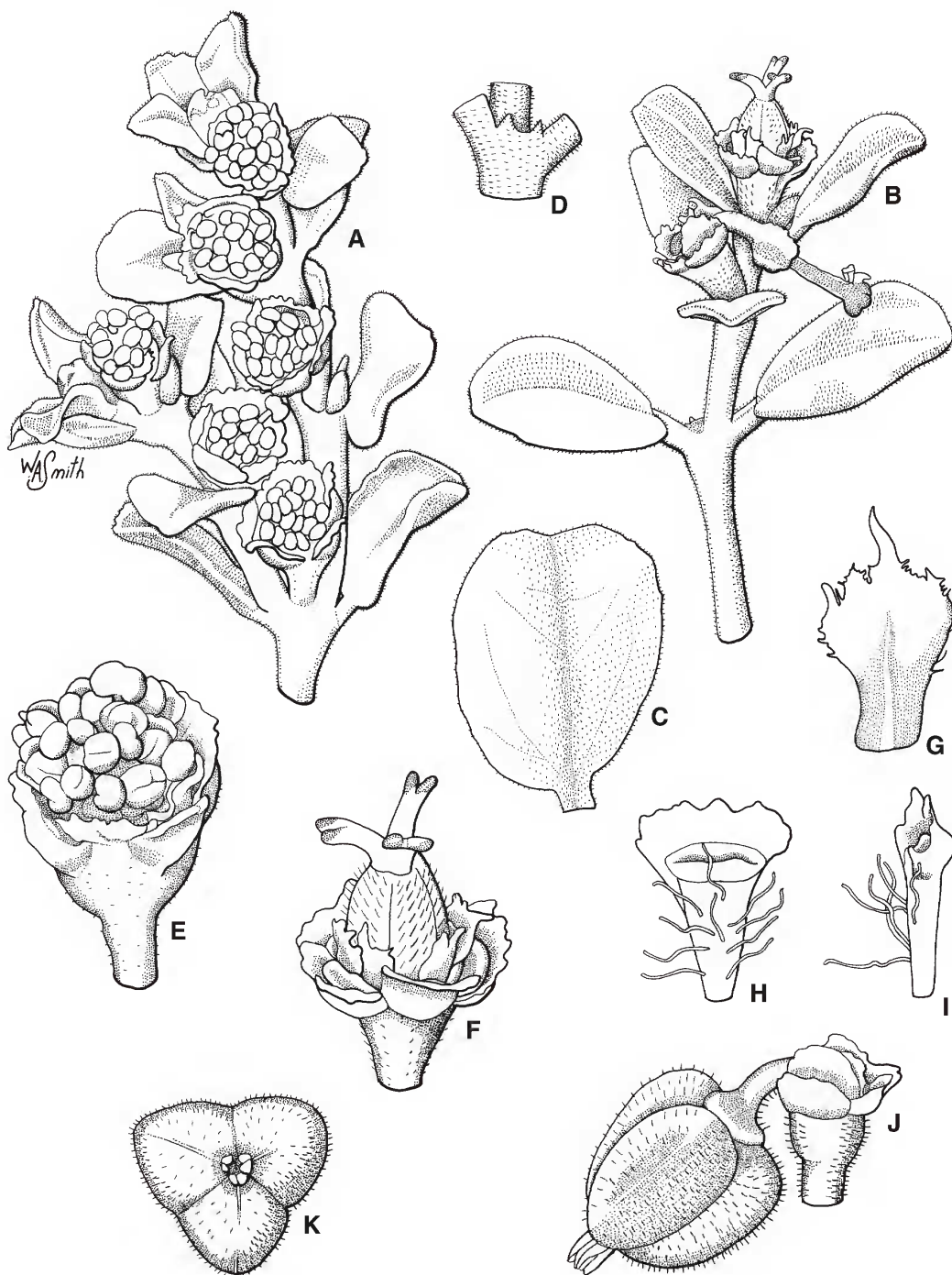


Fig. 14. *Euphorbia occulta*. A. branchlet with male cyathia $\times 8$. B. branchlet with female cyathia $\times 8$. C. leaf $\times 8$. D. stipules $\times 16$. E. cyathia with male flowers $\times 16$. F. cyathia with female flower $\times 16$. G. involucre bract $\times 32$. H. cyathial gland with appendage, adaxial view $\times 16$. I. cyathial gland with appendage, lateral view $\times 16$. J. capsule with cyathia $\times 12$. K. capsule, top view $\times 12$. A, E & G from Booth 3536A & Kelman (BRI); B–D, F & H–K from Booth 3536 & Kelman (BRI). Del. W. Smith

Illustration: Forster (2000: 713, fig. 1).

Monoecious or dioecious, annual or herbaceous perennial with slender woody taproot, few to many stems arising from rootstock. **Stems** prostrate, sparingly to much branched, longitudinally ridged, with a moderately dense indumentum or glabrous; hairs spreading, \pm straight, 0.1–0.4 mm long, white. **Interpetiolar stipules** subulate to triangular, 0.2–0.6 mm long, entire or bipartite, glabrous or pubescent; margin lacinate. **Leaves:** petiole 0.5–1 mm long, smooth, with indumentum as for stems or glabrous; blade elliptic or broad-elliptic, 5–10 mm long, 4–8.5 mm wide, 1–1.5 times longer than wide; adaxial surface glaucous, blue-green sometimes red along margin, minutely papillose (visible at 40 \times mag.), with moderately dense indumentum consisting of spreading, straight hairs 0.1–0.3 mm long or glabrous; abaxial surface pale blue-green, with surface texture and indumentum as for adaxial surface; base asymmetric with one side cordate, the other obtuse to rounded; margin serrulate or sparingly minutely toothed distally; apex rounded. **Cyathia** solitary at the nodes; cyathial peduncles 0.2–2.5 mm long. **Involucres** campanulate, 0.8–1.4 mm long, 0.8–1.5 mm across; lobes (rarely 4)5, broad-triangular, 0.3–0.4 mm long, margin fimbriate; glands 4(rarely 5), stipitate, patelliform, planar or shallowly concave, transverse-oblong or reniform in outline, 0.4–0.5 mm long, 0.6–1 mm wide, pale green; gland appendages conspicuous, spreading radially, oblong, 0.4–0.5 mm long, 0.8–1.3 mm wide, white, glabrous, margin \pm entire or shallowly lobed; bracteoles 0.6–0.8 mm long, adnate for *c.* 1/3 of their length to involucre, free portion divided into subulate hirsute segments. **Staminate flowers** 20–25 per cyathium; pedicels 0.5–1.3 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, spreading, smooth, glabrous or minutely pubescent, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exserted from the involucre on pedicel to 2.5 mm long, very broad-ovate or depressed ovate in lateral view, 1.6–2.6 mm long, 2.1–2.8 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous or with

moderately dense indumentum; hairs evenly distributed over capsule, spreading, 0.1–0.2 mm long; hypogynous disc entire. **Seeds** ovate in outline, 1.7–1.8 mm long, 1–1.1 mm tangentially, 1–1.1 mm radially, tetragonous in cross section; dorsal faces convex; ventral faces planar or slightly concave; all faces with narrow rounded irregular or transverse ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown or red-brown. **Fig. 27E.**

Additional selected specimens examined: Queensland. PORT CURTIS DISTRICT: South Percy Island, 50 km NE of Arthur Point, Shoalwater Bay, Oct 1989, *Batianoff 11422 et al.* (BRI); Mt Wheeler, Rockhampton, Jan 1989, *Specht 3 & Reeves* (BRI, NSW); Gumigil Mining Lease, 18 km SSW of Marlborough, Jul 2000, *Champion 540 & Whereat* (BRI); on Rockhampton – Marlborough road, 50 km from Rockhampton, May 1960, *Johnson 1720* (BRI); 9.5 km W of Canoona, First Sugarloaf, Jan 1988, *Forster PIF3393* (BRI).

Distribution and habitat: *Euphorbia ophiolitica* is restricted to central Qld, from Percy Isles (east of Mackay) to the Marlborough district (north of Rockhampton) (**Map 36**). It grows on stony hillsides or ridges, in open woodland or rarely grassland communities, on shallow stony soils derived from serpentinite rocks.

Phenology: Flowers and fruits have been collected in January, May, July and October.

Notes: *Euphorbia ophiolitica* is similar to *E. laciniloba* and *E. papillifolia*. For features distinguishing *E. ophiolitica* from those species, refer to the ‘Notes’ section under the species concerned.

37. *Euphorbia ophthalmica Pers., *Syn. Pl.* 2: 13 (1807); *Chamaesyce ophthalmica* (Pers.) D.G.Burch, *Ann. Missouri Bot. Gard.* 53: 98 (1966). **Type:** [Brazil.] Rio de Janeiro, [July 1767,] [*P.*] *Commerson* [238] (holo: P-JU *n.v.* [IDC microfiche 6206. 1187, II. 2]).

Illustrations: Burger & Huft (1995: 19, fig. 6); Harris (2001: 32, fig. 2).

Monoecious, annual to 8 cm high, few to many stems arising from base. **Stems** prostrate, decumbent or weakly ascending, sparingly to much branched, smooth, moderately dense to densely hairy; indumentum consisting

of white weakly appressed crispate hairs to 0.5 mm long interspersed with yellow spreading \pm straight segmented hairs to 1.5 mm long. **Interpetiolar stipules** subulate to narrow-triangular, 0.5–2 mm long, bifid to deeply bipartite, sparsely hairy with white ascending hairs to 0.4 mm long; margin lacinate. **Leaves:** petiole 0.5–2.5 mm long, smooth, with indumentum as for stems; blade oblong or narrow-ovate to ovate, 6–15 mm long, 3–8 mm wide 1.5–2 times longer than wide; adaxial surface green occasionally with reddish tinge on margin, smooth, glabrous or sparsely hairy with white, spreading to ascending, \pm straight hairs 0.6–0.9 mm long; abaxial surface pale green, smooth, with a moderately dense to dense indumentum of white, spreading to ascending, \pm straight hairs to 1.2 mm long; base asymmetric with one side rounded, the other cuneate; margin serrulate; apex acute to obtuse. **Cyathia** in dense (10–30 cyathia) capitate, terminal cymose clusters to 10 mm in diameter on peduncles 1–7.5 mm long; bracts subulate to narrowly triangular, to 0.7 mm long; cyathial peduncles 0.5–1 mm long. **Involucre** turbinate, 0.6–0.8 mm long, c. 0.5 mm across; lobes 5, subulate, 0.1–0.2 mm long, margin lacinate; glands 4, stipitate, cupuliform, with shallow central pit and sometimes thickened rim, transverse-elliptic to orbicular in outline, c. 0.1 mm long c. 0.1 mm wide, pink or pale green; gland appendages present and conspicuous or absent, spreading radially, transverse-oblong, to 0.3 mm long and 0.3 mm wide, white, glabrous, margin irregularly lobed; bracteoles filamentous, 0.5–0.6 mm long, glabrous, entire or lacinate distally. **Staminate flowers** 2–5 per cyathium; pedicels 0.3–0.5 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.3–0.5 mm long, erect to spreading, smooth, glabrous, each bifid for 1/2–2/3 of their length, the apices clavate. **Capsules** exserted from involucre on pedicel to 1.7 mm long, depressed ovate in lateral view, 0.8–1.5 mm long, 1.1–1.3 mm across, shallowly 3-lobate with keels acute, smooth, with moderately dense indumentum; hairs appressed, 0.1–0.2 mm long, evenly distributed over capsule; hypogynous disc entire. **Seeds** ovate in outline, 0.7–1 mm

long, 0.5–0.6 mm tangentially, 0.4–0.5 mm radially, tetraquetrous in cross section; dorsal and ventral faces planar to concave; all faces with 5–7 faint narrow acute transverse ridges; exotesta thin, of even thickness, pale brown, microgranulate especially along ridges, becoming mucilaginous when moistened; endotesta pale red-brown. **Fig. 27F.**

Additional selected specimens examined: **Queensland.** BURNETT DISTRICT: Walter Street, Kingaroy, Mar 2004, *Halford Q8170 & Edginton* (BRI). MORETON DISTRICT: Lookout, Dulong road, c. 4.5 km W of Nambour, Apr 2003, *Halford Q7510* (BRI); Brisbane Botanic Gardens, Mt Coot-tha, Mar 2000, *Harris 123* (BRI); between Woolley and Woodstock Streets, Taringa, 6 km from Brisbane GPO, Apr 2000, *Bean 16179* (BRI, MEL); Brisbane, Salisbury, Feb 2001, *Batianoff 210201* (BRI); 15 Whittaker Street, North Ipswich, Apr 1992, *Williams 92002* (BRI); 0.8 km along Sugarloaf Road, Warrill View, SSW of Ipswich, Nov 2000, *Bean 17023* (BRI); Newmarket end, Ashgrove Avenue, Newmarket, Brisbane, Mar 2000, *Forster PIF25475* (AD, BRI); Ormeau Railway Station, between Beenleigh & Nerang, May 2003, *Bean 20384* (BRI); Guanaba, Coomera River, 5 km SW of Oxenford, property I. Cairns, Apr 2003, *Forster PIF29300* (BRI); 8 km S of Canungra on road to O'Reillys, near winery, Mar 2003, *Fechner s.n. & Holland* (BRI [AQ733643]). **New South Wales.** Far North Coast Council depot, Wyrallah Road, East Lismore, Nov 2000, *Hosking 1965 & Scott* (BRI).

Distribution and habitat: *Euphorbia ophthalmica* is a native of southern Florida, the West Indies and Argentina and is naturalised in Australia. In Australia it occurs from Gladstone, Qld south to Lismore, NSW (**Map 37**). It grows along roadsides, in garden beds or lawns.

Phenology: Flowers and fruits have been collected from November to May.

Notes: *Euphorbia ophthalmica* is easily distinguished from the native Australian *Euphorbia* species by its indumentum of long yellowish coloured hairs on stems and petioles. *Euphorbia ophthalmica* is closely related to *E. hirta*, but may be distinguished by its slender, prostrate habit, generally shorter leaf blade (blade to 1.5 cm long compared with blade to 4.5 cm long for *E. hirta*), and terminal cymose glomerules compare with axillary and terminal for *E. hirta*.

38. *Euphorbia pallens* Dillwyn, *Rev. Hortus Malab.* 54 (1839); *Chamaesyce pallens* (Dillwyn) V.S.Raju, *J. Econ. Taxon. Bot.* 28: 92 (2004). **Type:** [India]. illustration of Ben-Pala, Rheede, *Hort. Malab.* 10: 115, t. 58 (1690).

Illustrations: Lin *et al.* (1991: 224, fig 4), as *Chamaesyce atoto*; Forster (1994: 9, fig 3–5) as *Euphorbia atoto*.

Monoecious, herbaceous perennial to 50(80) cm high, few to many stems arising from thickened woody rootstock. **Stems** ascending to erect or prostrate, much branched, smooth, often with whitish bloom glabrous. **Interpetiolar stipules** triangular, 1–1.5 mm long, abaxial surface glabrous or hairy with white ascending hairs *c.* 0.1 mm long, adaxial surface hairy with white ascending hairs *c.* 0.1 mm long; margin lacerate or fimbriate. **Leaves:** petiole 1.5–2.7 mm long, smooth; blade oblong, ovate or elliptic, 24–35 mm long, 11–22 mm wide, 1.4–2.7 times longer than wide; adaxial surface blue-green or pale green with whitish bloom, smooth or minutely papillose, glabrous abaxial surface pale blue-green sometimes with reddish tinge, smooth glabrous, base asymmetric with one side cordate, the other obtuse or shallowly cordate; margin entire; apex obtuse to rounded or retuse, sometimes with apiculate tip. **Cyathia** in congested 2–5 branched dichasial cymes together with a solitary cyathium at the distal nodes; peduncles 5–20 mm long; bracts leaf-like but smaller than the primary stem leaves; cyathial peduncles 2–5 mm long. **Involucre** turbinate or cupuliform, 1.4–1.5 mm long, 1.5–1.8 mm across; lobes 5, narrow-triangular to broad-triangular, 0.5–0.6 mm long, margin entire, fimbriate or lacinate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-elliptic or orbicular in outline, 0.3–0.4 mm long, 0.5–0.6 mm wide, pale green; gland appendages present but inconspicuous, spreading radially, transverse-linear, to 0.1 mm long, 0.5–0.6 mm wide, pink or white, glabrous, margin entire; bracteoles 1.5–1.9 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into numerous linear glabrous or hirsute segments. **Staminate flowers** 5–20 per cyathium; pedicels 1–2 mm long; staminal filaments

0.5–0.7 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, ascending, spreading distally, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices dorsiventrally flattened. **Capsules** exserted from involucre on pedicel to 6 mm long, very broad-ovate or transversely broad-elliptic in lateral view, 2.3–2.8 mm long, 2.8–3.8 mm across, shallowly or deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** very broad-elliptic or very broad-ovate in outline, 1.5–1.7 mm long, 1.2–1.5 mm tangentially, 1.3–1.4 mm radially, trigonal or suborbicular in cross section; dorsal and ventral faces convex, smooth; exotesta thin, of even thickness over surface, white or pale brown, microreticulate; not becoming mucilaginous when moistened; endotesta brown. **Fig. 27G.**

Additional selected specimens examined: Queensland. COOK DISTRICT: Kerr Island, Torres Strait, Jan 2007, *Waterhouse BMW7498* (BRI); Deliverance Island, Apr 1996, *Waterhouse BMW3797* (BRI); Ida Point, *c.* 4 km SE of Cape York, Oct 1965, *Smith 12524* (BRI); Muttee Head, Cape York, Mar 1990, *Forster PIF6433* (BRI); Muddy Bay, Cape York, Jun 1994, *Forster PIF15316 & Tucker* (BRI); Saunders Island, Nov 1973, *Stoddart 5073* (BRI); Bathurst Bay, Aug 1974, *Hyland 7403* (BRI); Howick Island, Oct 1973, *Stoddart 4857* (BRI); Coquet Island, Howick Group, Mar 1984, *Godwin s.n.* (BRI [AQ440547]); Sinclair Island, Aug 1973, *Stoddart 4190* (BRI, MEL); Eagle Island, Great Barrier Reef, Jan 1973, *Heatwole s.n.* (BRI [AQ202465]); Ingram Island, Jul 1973, *Stoddart 4045* (BRI, NSW); Lizard Island, Sep 1967, *Heatwole 68* (BRI); Eagle Island, Oct 1973, *Stoddart 4821* (BRI); Three Isles, Sep 1973, *Stoddart 4470* (BRI); 2 km N of settlement at Bramston Beach, 12 km E of Babinda, Apr 1975, *McDonald 1490 & Batianoff* (BRI); Mission Beach, Dec 1949, *Clemens s.n.* (BRI [AQ202454]). NORTH KENNEDY DISTRICT: Edmund Kennedy N.P., near Cardwell, Dec 1991, *Bean 3874* (BRI); Hinchinbrook Island, W of Kirkville Hills, Aug 1970, *Everist 9657* (BRI); George Point, Hinchinbrook Island, Apr 1994, *Cumming 12773* (BRI).

Distribution and habitat: *Euphorbia pallens* ranges from Sri Lanka through Malaysia, southern China to Australia and the southwestern Pacific Islands. In Australia, it occurs in coastal areas from Torres Strait south along the east coast of Cape York Peninsula to Hinchinbrook Island (**Map 38**). It grows on coastal sands on frontal beach dunes and coral cays.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: The name *Euphorbia atoto* G.Forst. (*Chamaesyce atoto* (G.Forst.) Croizat) has been previously applied to this species in Australia (Forster 1994; Forster & Halford 2010), as well as in south east Asia and the Pacific (Hurusawa 1954; Smith 1981; Lin *et al.* 1991). Smith (1981) selected a lectotype for the name *E. atoto* from material at Kew. Florence (1996) set forth an opposing view on the lectotypification of *E. atoto* on the grounds that the specimen selected was in serious conflict with the protologue and that there was another element available that was part of the original material and morphologically agreed with the description in the protologue (ICBN Art 9.17). Esser & Chayamarit (2001) have put forward the argument that “it is not obvious whether the discrepancy discussed by Florence in the inflorescence architecture justifies this decision”. We have examined microfiche, photographs and digital images of the relevant material collected by the Forsters which resides in a number of herbaria (P-Forst, BM, G, GEOT, UPS-THUNB) and we concur with Florence’s conclusions. As circumscribed by Florence (1996) *E. atoto* is endemic to Tahiti. Therefore, another name is required for the widespread seashore species. *Euphorbia pallens* Dillwyn seems to be the next available name.

Euphorbia pallens is similar to *E. litticola*, *E. obliqua* and *E. psammogeton*. For features distinguishing *E. pallens* from *E. litticola*, refer to the ‘Notes’ section under that relevant species. *Euphorbia pallens* can be distinguished from *E. obliqua* by having its cyathia arranged in terminal or axillary lax to congested dichasial cymes (compared with cyathia solitary in upper axils for *E. obliqua*) and generally larger leaves ($24\text{--}35 \times 11\text{--}22$ mm as compared with $9\text{--}20 \times 6\text{--}10$ mm for *E. obliqua*). It differs from *E. psammogeton* by its smooth rather than rugulose seeds, and smaller gland appendages (up to 0.1 mm long as compared with 0.2–0.4 mm long for *E. obliqua*).

Hassall (1977) recorded a chromosome number $n = 8$ for two voucher collections that were identified as *E. atoto* at the time, (RLS [R.L.Specht] 7478, Lizard Island; and GLW

[G.L.Webster] 73118, Currimine [Kurrimine] Beach, both from north Queensland). Unfortunately, we have been unable to locate the vouchers that were apparently lodged in BRI and cannot confirm that they are *E. pallens*.

39. *Euphorbia papillata* Halford & W.K.Harris, **species nova** arcte similis *E. ferdinandi* Baill. sed habitu robustiore seminibus latioribus 0.7–1 mm latis (ad vicem 0.5–0.7 mm latis), glandulae appendicibus majoribus 0.1–0.2 mm longis (ad vicem appendicibus aut absentibus aut usque 0.1 mm longis), floribus staminatis 5–10 in quoque cyathio (in vicem floribus paucioribus 3–5 in quoque cyathio) differt. *Euphorbia papillata* quondam saepe putabatur eadem *E. drummondii* Boiss. esse sed seminum superficiebus \pm laevibus (ad vicem superficiebus 3–6 porcis transversis distinctis praeditis), foliorum fructuumque superficiebus papillois (ad vicem superficiebus laevibus), glandulae appendicibus 0.1–0.2 mm longis (ad vicem appendicibus usque 0.1 mm longis) distinguenda. **Typus:** Northern Territory. Georgina Station, 8 km NW of No. 14 Bore, 22 September 1992, P.K.Latz 12754 (holo: BRI; iso: MEL, NT).

Monoecious, herbaceous perennial to 25 cm high, many stems arising from woody taproot crown, the whole plant glabrous. **Stems** prostrate or ascending to erect, much branched, papillose or smooth, often longitudinally ridged. **Interpetiolar stipules** subulate or narrow-triangular, 0.8–1.6 mm long, bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.3–0.7 mm long, smooth or papillose; blade obovate, oblong-obovate or narrow-oblong, 4–11 mm long, 2–5.5 mm wide, 1.6–3.1 times longer than wide; adaxial surface dark green or blue-green, papillose; abaxial surface blue-green but paler than adaxial surface, papillose; base asymmetric with one side cordate, the other cuneate or obtuse; margin serrulate distally; apex rounded or mucronate. **Cyathia** solitary at the nodes, often gathered together on short leafy lateral branchlets with subtending leaves usually slightly smaller than primary stem leaves; peduncles 0.3–0.6 mm long, papillose. **Involucre**s campanulate or turbinate, 0.7–1.1 mm long, 0.8–1.4 mm

across; lobes 5, triangular, 0.3–0.5 mm long, margin entire or fimbriate; glands 4, shortly stipitate, cupuliform, with distinct central pit and thickened rim, transverse-oblong or transverse-elliptic in outline, 0.15–0.3 mm long, 0.25–0.4 mm wide, pink to red or pale green; gland appendages conspicuous, spreading radially, transverse-oblong, transverse-linear or reniform, 0.1–0.2 mm long, 0.5–0.7 mm wide, pink or white, glabrous, margin entire or shallowly lobed; bracteoles obovate, *c.* 1 mm long, divided into numerous subulate hirsute segments. **Staminate flowers** 5–10 per cyathium; pedicels 0.9–1.1 mm long; staminal filaments *c.* 0.1 mm long. **Pistillate flowers:** styles 0.1–0.4 mm long, spreading, ascending to erect, smooth or papillose, glabrous, each entire or bifid for *c.* 1/2 of their length, the apices stout terete. **Capsules** exserted from involucre on pedicel to 2 mm long; broad-elliptic in lateral view, 1.9–2.3 mm long, 1.6–2.4 mm across, shallowly 3-lobate with keels obtuse or acute, papillose, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 1.3–1.6 mm long, 0.7–1 mm tangentially, 0.6–1 mm radially, tetraquetrous in cross section; dorsal faces \pm planar, smooth or with faint narrow medial longitudinal ridge; ventral faces planar or concave, smooth; exotesta thin, of even thickness over surface, grey-white, microreticulate or microgranulate, becoming mucilaginous when moistened; endotesta pale brown to red brown.

Distribution and habitat: *Euphorbia papillata* is widespread in southern NT and western Qld, extending into northern SA and north-western NSW, but absent from the Simpson, Sturt Stony and Strzelecki Deserts.

Etymology: The specific epithet is from Latin *papillatus*, having papillae, in reference to the papillate surface of the capsules, leaves and sometimes the young branchlets of this species.

Notes: *Euphorbia papillata* closely resembles *E. ferdinandi* but differs from that by its more robust habit, broader seeds (0.7–1 mm versus 0.5–0.7 mm for *E. ferdinandi*), larger gland appendages (0.1–0.2 mm long versus gland appendages absent or up to 0.1 mm long for *E. ferdinandi*), and more staminate flowers per cyathium (5–10 versus 3–5 for *E. ferdinandi*).

Euphorbia papillata was previously often identified as *E. drummondii* but it is distinguished from that species by its \pm smooth seed surfaces (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*), papillose surfaces on leaves and fruits (versus smooth for *E. drummondii*), and larger gland appendages (0.1–0.2 mm long versus gland appendages up to 0.1 mm long for *E. drummondii*).

As accepted here, *E. papillata* is very variable in leaf size and stem texture. Two varieties are recognised which can be distinguished by the following key.

Key to varieties of *Euphorbia papillata*

- | | |
|---|---|
| Stems papillose | 39a. <i>E. papillata</i> var. <i>papillata</i> |
| Stems \pm smooth, lacking papillae. | 39b. <i>E. papillata</i> var. <i>laevicaulis</i> |

39a. *Euphorbia papillata* var. *papillata*

Chamaesyce sp. (Pathungra A.Gunness AG2118); Forster & Halford (2010: 65).

Stems papillose. **Leaves:** petiole 0.3–0.7 mm long, papillose; blade obovate or oblong-obovate, 4–10 mm long, 2–5.5 mm wide, 1.6–2.3 times longer than wide. **Involucres** campanulate or turbinate, 0.9–1.1 mm long, 1–1.4 mm across; lobes 0.4–0.5 mm long, margin fimbriate. *n* = 11. **Figs 15, 27H.**

Additional selected specimens examined: Northern Territory. Phillip Creek Station, May 1993, *Egan* 2287 (BRI); Alexandria Station, 5 km NE [of] Buchanan Creek, Nov 1986, *Henshall* 4131 (DNA, NT); 35.5 miles [c. 57 km] NNW [of] Wauchope township, Aug 1956, *Lazarides* 5849 (BRI, DNA); Wakaya Desert, May 1993, *Latz* 13086 (DNA, MEL); 40 km N [of] Plenty Highway on Sandover Highway, Apr 1988, *Kimbel* 68 (DNA, NT); 12 miles [c. 19 km] W of Stuart Highway, along Yuendumu Road, Apr 1967, *Maconochie* 62 (AD, DNA, MEL); Illamurta Springs area; 7.5 km west, Aug 1988, *Barritt* 323 (DNA); Uluru (Ayers Rock – Mt Olga) N.P.; on the Docker River road, 53.6 km WNW

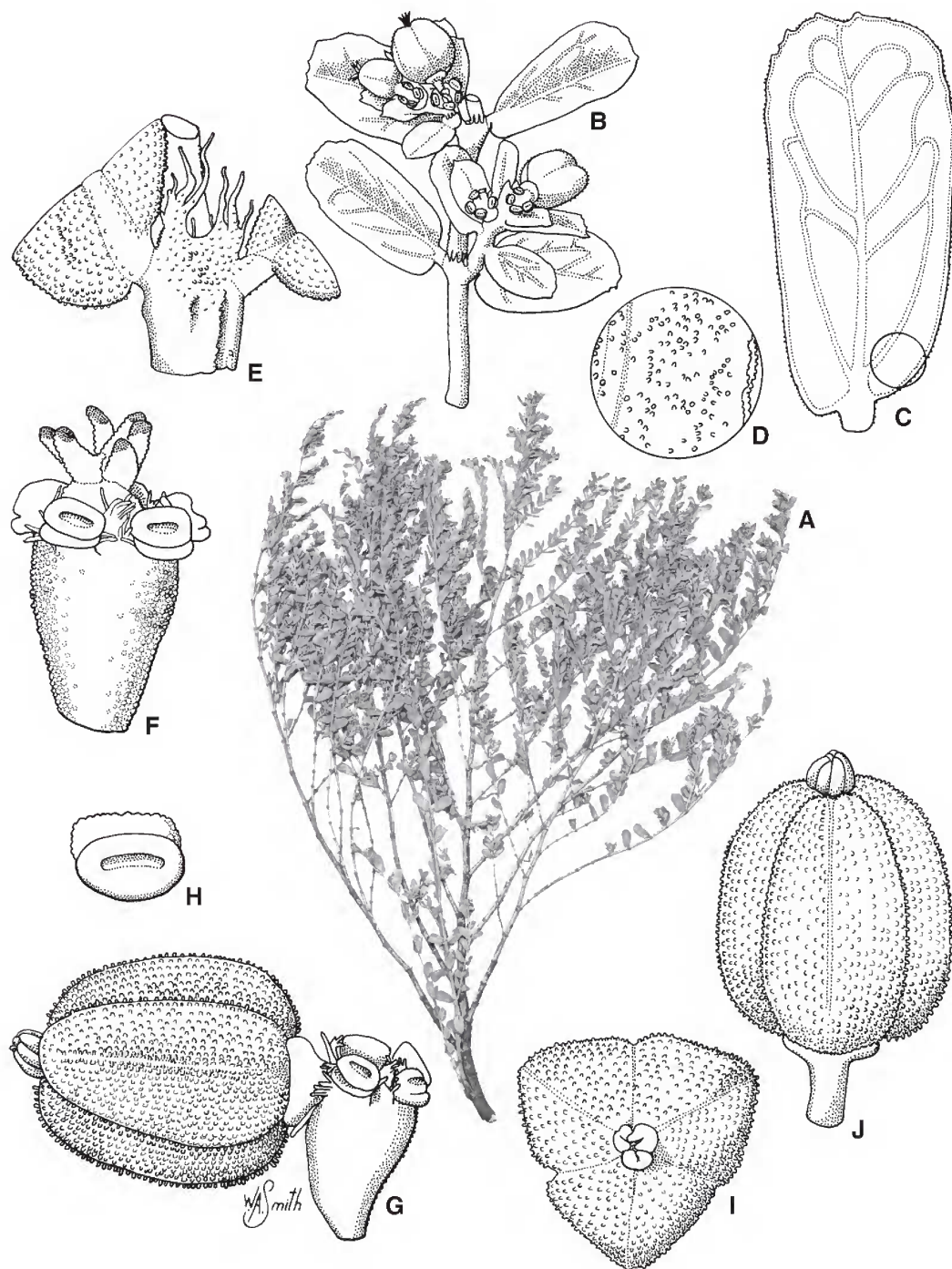


Fig. 15. *Euphorbia papillata* var. *papillata*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 4$. C. leaf $\times 8$. D. indumentum on upper leaf surface $\times 32$. E. stipules $\times 24$. F. cyathia with female flower $\times 24$. G. capsule with cyathia $\times 16$. H. cyathial gland with appendage, adaxial view $\times 32$. I. capsule, top view $\times 16$. J. capsule, lateral view $\times 16$. A, C & D from *Latz* 12754 (NT); B, E–J from *Halford Q8597 & Thomas* (BRI). Del. W.Smith.

of the Ranger Station, Aug 1988, *Lazarides & Palmer 539* (MEL). **Queensland.** BURKE DISTRICT: 1 km W of Torrens Creek (township) along Flinders Highway, towards Hughenden, Apr 2006, *Halford Q9020 & Batianoff* (BRI). GREGORY NORTH DISTRICT: 31 km from Winton, Bladensburg N.P., Sep 2005, *Halford Q8597 & Thomas* (BRI); 60 km S of Winton on road to Opalton, Sep 2005, *Halford Q8600 & Thomas* (BRI); Jundah – Winton road, 38 km S of Mayne River crossing, May 2004, *Bean 22495* (BRI). WARREGO DISTRICT: c. 13 km E of Quilpie, near junction of Adavale Road and Quilpie – Cheepie Road, Jun 2002, *Pollock ABP1301 & Walsh* (BRI). GREGORY SOUTH DISTRICT: 81 km by road NW of Thylungra and 197 km NW of Quilpie on the Windorah Road, Mar 2001, *Thomas 1948 & Fechner* (BRI). **South Australia.** Everard Ranges, Wildcat Bore, Sep 1963, *Eichler 17467* (AD); near Marla, Oct 1998, *Bates 51375* (AD); c. 25 km W of Tallaringa Well, May 1967, *Lothian 3841* (AD). **New South Wales.** 4 km W of Weebah Gate, NSW – Qld border, Nov 1976, *Pickard 3305* (NSW).

Distribution and habitat: *Euphorbia papillata* var. *papillata* is widespread in southern NT and western Qld, extending into northern SA and north-western NSW, but absent from the Simpson, Sturt Stony and Strzelecki Deserts (**Map 39a**). It grows in mulga woodland, eucalypt open woodland, open shrubland or tussock grassland communities on red sandy to loam soils on plains, low lateritic or limestone rises; also rarely recorded on black clay soils in Mitchell grassland or open woodland communities.

Phenology: Flowers and fruits have been collected throughout the year, particularly from March to June.

39b. *Euphorbia papillata* var. *laevicaulis* Halford & W.K.Harris, **varietas nova** ab *E. papillata* var. *papillata* caulibus \pm laevibus papillis carentibus differt. **Typus:** Queensland. MITCHELL DISTRICT: Moorrinya National Park, 7 May 2006, *E.J.Thompson & G.W.Wilson TAN551* (holo: BRI).

Stems smooth. **Leaves:** petiole 0.5–0.7 mm long, smooth; blade narrow-oblong, 6–11 mm long, 2–3.6 mm wide, 2.2–3.1 times longer than wide. **Involucres** turbinate, 0.7–0.8 mm long, c. 0.8 mm across; lobes 0.3–0.4 mm long, margin entire or fimbriate. **Fig. 27I.**

Additional selected specimens examined: **Northern Territory.** 29 km S [of] Renner Springs, Jun 1977, *Parker 942* (BRI). **Queensland.** BURKE DISTRICT: 26 km N of Burke and Wills Roadhouse, Mar 2003, *McDonald KRM1332* (BRI); Glengalla, 63 miles [c. 101 km] N of Maxwellton, Jun 1947, *Everist 3035* (BRI); 1 km W of

Torrens Creek (township) along Flinders Highway, towards Hughenden, Apr 2006, *Halford Q9021 & Batianoff* (BRI). NORTH KENNEDY DISTRICT: Flinders Highway, 36 km E of Torrens Creek, Jul 2000, *Bean 16764* (BRI); 20 km from Charters Towers, towards Clermont, Apr 2002, *Bean 18961* (BRI, MEL). SOUTH KENNEDY DISTRICT: 6 km N of Ulcanban homestead, Mar 2002, *Turpin GPT740 & Thompson* (BRI). MITCHELL DISTRICT: 72 km S of Prairie on stock route, 1 km E of Holmleigh homestead, Mar 2004, *Thompson TAN153 & Cumming* (BRI); 32 km SSE of Prairie on Stock Route 503 bordering Ashton Station, Mar 2004, *Thompson TAN132 & Cumming* (BRI); Corinda Station, 10 km NE of Corinda homestead, May 2006, *Thompson TAN264 & Wilson* (BRI); Corinda Station, 16.1 km N of Corinda homestead, May 2006, *Thompson TAN333 & Wilson* (BRI); Moorrinya N.P., c. 100 km S of Torrens Creek, Apr 2005, *Booth 3707 & Thompson* (BRI); Corinda, 100 km N of Aramac, Mar 2004, *Cumming 22475 & Thompson* (BRI); 50 km from Longreach, towards Winton, May 2004, *Bean 22594* (BRI).

Distribution and habitat: *Euphorbia papillata* var. *laevicaulis* extends from Cloncurry eastward to Charters Towers and south to near Longreach, Qld; with a disjunct occurrence near Renner Springs, NT (**Map 39b**). It is recorded growing in a variety of habitats: tussock/hummock grassland, *Eremophila mitchellii* Benth. low open woodland, mulga woodland and eucalypt woodland/open forest, on mostly undulating plains. The soils vary from sands to clays.

Phenology: Flowers and fruits have been collected from January, March to July and October.

Notes: *Euphorbia papillata* var. *laevicaulis* differs from *E. papillata* var. *papillata* by its \pm smooth stems that lack papillae.

Etymology: The varietal epithet is from Latin *laevis*, smooth, and *caulis*, stem, in reference to the more or less smooth surface of the stems of this variety.

40. *Euphorbia papillifolia* Halford & W.K.Harris, **species nova** quoad formam sculturamque seminum superficierum similis *E. ophioliticae* (P.I.Forst.) Y.Yang differt autem foliis oblongis ovatisve 1.5–2.8 plo longioribus quam latioribus (ad vicem foliis ellipticis usque late ellipticis 1–1.5 plo longioribus quam latioribus) glandis minoribus 0.1–0.4 \times 0.3–0.8 mm (ad vicem glandulis 0.4–0.5 \times 0.6–1 mm) seminibus minoribus 1.3–1.6 \times 0.7–1 \times 0.8–1 mm (ad

vicem seminibus $1.7\text{--}1.8 \times 1\text{--}1.1 \times 1\text{--}1.1$ mm) plerumque stipulis longioribus $0.5\text{--}1.6$ mm longis (ad vicem stipulis $0.2\text{--}0.6$ mm longis). *Euphorbia papillifolia* crescit in solis argillis repantis saepe a basalto orituris quoniam *E. ophiolitica* in solis a saxis serpentinis orituris. **Typus:** Queensland. PORT CURTIS DISTRICT: South Kariboe Creek crossing, Burnett Highway, between Biloela and Monto, 19 March 2010, D. Halford Q9771 & G.P. Guymer (holo: BRI, iso: MEL, NSW, *distribuendi*).

Monoecious or dioecious, herbaceous perennial to 10 cm high, few to many stems arising from woody rootstock. **Stems** prostrate or decumbent, sparingly to much branched, often longitudinally ridged, glabrous (rarely with a moderately dense indumentum, Allison TH5034 [BRI]); hairs spreading, straight, $0.1\text{--}0.4$ mm long, white. **Interpetiolar stipules** subulate or narrow-triangular, $0.5\text{--}1.6$ mm long, bifid or deeply bipartite, glabrous; margin entire, lacinate or sometimes fimbriate. **Leaves:** petiole $0.6\text{--}1.1$ mm long, smooth, glabrous; blade oblong or ovate, $7\text{--}11$ mm long, $2.5\text{--}9$ mm wide, $1.8\text{--}2.8$ times longer than wide; adaxial surface blue-green sometimes with reddish tinge along margin; minutely papillose (visible at $40\times$ mag.), glabrous (rarely with a moderately dense indumentum consisting of spreading, straight hairs to 0.4 mm long, abaxial surface pale grey to white; minutely papillose (visible at $40\times$ mag.), glabrous or with indumentum as of adaxial surface; base asymmetric with one side cordate, the other cuneate or obtuse to rounded; margin serrulate or sparingly minutely toothed sometimes only distally (rarely entire); apex acute to obtuse or rounded. **Cyathia** solitary at the nodes, often gathered together on short leafy lateral branches; peduncles $0.6\text{--}1.3(2.3)$ mm long, smooth, glabrous. **Involucres** turbinate or cupuliform, $0.6\text{--}1.5$ mm long, $0.6\text{--}1.8$ mm across; lobes 5 or 6, triangular, $0.2\text{--}0.4$ mm long, margin lacinate or fimbriate; glands 4–6, stipitate, patelliform, planar or concave, transverse-oblong or reniform in outline, $0.1\text{--}0.4$ mm long, $0.3\text{--}0.8$ mm wide, pink, red or yellowish green; gland appendages conspicuous, spreading radially, transverse-oblong, broad-obovate to very broad-obovate,

obdeltoid or reniform, $0.1\text{--}0.9$ mm long, $0.9\text{--}1.4$ mm wide, pink or white, glabrous, margin entire, erose or shallowly lobed; bracteoles $0.5\text{--}0.6$ mm long, adnate for *c.* $1/2$ of their length to involucre, free portion divided into few linear hirsute segments. **Staminate flowers** 1–30 per cyathium; pedicels $0.8\text{--}1.3$ mm long; staminal filaments $0.1\text{--}0.3$ mm long. **Pistillate flowers:** styles $0.3\text{--}0.8$ mm long, connate at the base into a column for *c.* $1/6$ of their length, spreading, minutely papillose or smooth, pubescent or glabrous, each bifid for $1/3\text{--}1/2$ of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3.5 mm long, broad-elliptic or transversely broad-elliptic in lateral view, $1.5\text{--}2.1$ mm long, $1.7\text{--}2.2$ mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate to broad-ovate in outline, $1.3\text{--}1.6$ mm long, $0.7\text{--}1$ mm tangentially, $0.8\text{--}1$ mm radially, tetraquetrous or tetragonous in cross section; dorsal faces convex; ventral faces planar to concave; all faces smooth, faintly undulate or with faint to distinct narrow rounded irregular ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown.

Distribution and habitat: *Euphorbia papillifolia* is widespread in eastern Australia from near Mount Surprise, north-eastern Qld, south to the Bathurst district, NSW.

Etymology: The specific epithet is from Latin *papillatus*, having papillae, and *-folius*, leaved, in reference to the papillose leaf surface of this species.

Notes: *Euphorbia papillifolia* is similar to *E. ophiolitica* in seed shape and seed surface texture. It differs in having oblong or ovate leaves $1.5\text{--}2.8$ times longer than wide (versus elliptic to broadly elliptic, $1\text{--}1.5$ times longer than wide for *E. ophiolitica*), smaller glands ($0.1\text{--}0.4 \times 0.3\text{--}0.8$ mm versus $0.4\text{--}0.5 \times 0.6\text{--}1$ mm), smaller seed dimensions ($1.3\text{--}1.6 \times 0.7\text{--}1 \times 0.8\text{--}1$ mm versus $1.7\text{--}1.8 \times 1\text{--}1.1 \times 1\text{--}1.1$ mm) and generally longer stipules ($0.5\text{--}1.6$ mm long versus $0.2\text{--}0.6$ mm long). They also differ in habitat with *E. papillifolia* occurring on cracking clay soils often derived

from basalt substrate while *E. ophiolitica* is restricted to soils derived from serpentinite rocks.

As accepted here, *E. papillifolia* varies in breeding system, the number of gland per

cyathia and length of gland appendages. This variation is considered sufficient to warrant formal recognition of two varieties within this species which can be distinguished using the following key.

Key to varieties of *Euphorbia papillifolia*

- Plants monoecious; gland appendages 0.1–0.4 mm long; glands 4 per cyathia; staminate flowers per cyathia <15; styles 0.3–0.5 mm long **40a. *E. papillifolia* var. *papillifolia***
- Plants dioecious (rarely monoecious); gland appendages 0.4–0.9 mm long; glands 4–6 per cyathia; staminate flowers per cyathia ≥15, styles 0.5–0.8 mm long **40b. *E. papillifolia* var. *polyandra***

40a. *Euphorbia papillifolia* var. *papillifolia*

Monoecious, herbaceous perennials. **Stems** prostrate, glabrous or rarely with a moderately dense indumentum. **Involucres** turbinate, 0.6–1 mm long, 0.6–1.1 mm across; lobes 5, triangular, 0.2–0.3 mm long; glands 4, 0.1–0.3 mm long, 0.3–0.5 mm wide; gland appendages 0.1–0.4 mm long, 0.3–0.9 mm wide. **Staminate flowers** 1–10 per cyathium. **Female flowers** with styles 0.3–0.5 mm long. **Figs 16, 27J.**

Additional selected specimens examined: Queensland. COOK DISTRICT: Undara N.P., NW of Tobacco Spring, Dec 2006, *McDonald KRM6036* (BRI). BURKE DISTRICT: c. 92 km N of Hughenden, Apr 1998, *Thompson HUG531 et al.* (BRI). NORTH KENNEDY DISTRICT: Mt Fox, Dec 1949, *Clemens s.n.* (BRI [AQ202423]); several kms SE of turn off to Ingham, Jun 1999, *Addicott 113* (BRI); Burdekin River, 40 km N of Charters Towers, c. 1 km S of Keelbottom Mountain, Jul 1981, *Sharpe 2894* (BRI); N of Bowen, May 1997, *Calvert & Lockyers 1* (BRI); Millview, 15 km N of Charters Towers, Jul 2006, *Hooker NH675* (BRI). LEICHHARDT DISTRICT: 29 km S of Springsure, Mar 1995, *Fensham 2607* (BRI); 12 km SE of Rolleston, Jan 1996, *Fensham 2422* (BRI). PORT CURTIS DISTRICT: Surfus Hill, E of Marlborough Creek, Nov 1997, *McCabe C2* (BRI); Glen Geddes, near Rockhampton, Jun 1965, *Beaglehole ACB3567* (MEL, NSW); South Kariboe Creek, SE of Biloela, Jan 1996, *Bean 9637* (BRI). BURNETT DISTRICT: c. 8 km NW of 'Rawbelle', W of Monto, Jun 1996, *Bean 10379* (BRI). WARREGO DISTRICT: junction of Landsborough & Mitchell Highways, 5.5 km S of Augathella, Oct 2011, *Halford QM625* (BRI). MARANO DISTRICT: The Lamen, ESE of Roma, Jan 1998, *Bean 12989* (BRI).

Distribution and habitat: *Euphorbia papillifolia* var. *papillifolia* is widespread in central east Qld from Undara N.P., east to Mt

Fox (west of Ingham) and south to Roma and Monto (**Map 40a**). It inhabits *Dichanthium* spp. grassland or eucalypt/*Acacia* woodland on plains or gently undulating country. The soils are dark brown to black cracking clays often derived from basalt substrates.

Phenology: Flowers and fruits have been collected throughout the year.

40b. *Euphorbia papillifolia* var. *polyandra*

Halford & W.K.Harris, **varietas nova** a varietate typica plerumque glandulae appendicibus majoribus 0.4–0.9 × 0.9–1.4 mm (ad vicem appendicibus 0.1–0.4 × 0.3–0.9 mm), staminibus pluribus in quoque cyathio (15–30 non 1–7), stylis longioribus 0.5–0.7 mm longis (ad vicem stylis 0.3–0.5 mm longis), interdum seminibus majoribus 1.3–1.6 × 0.9–1 × 0.9–1 mm (ad vicem seminibus 1.3–1.4 × 0.7–0.9 × 0.8–0.9 mm) differt. **Typus:** New South Wales. eastern bank of Lake Inverell, c. 4 km SE of Inverell, 11 December 2002, *L.M.Copeland 3483* (holo: BRI, according to label information on the holotype sheet there are duplicates (isotypes) lodged at CANB, L, MEL, NE, NSW – all *n.v.*).

Chamaesyce sp. A.; James & Harden (1990: 428).

Dioecious (rarely monoecious), herbaceous perennials. **Stems** prostrate or decumbent, glabrous. **Involucres** turbinate or cupuliform, 0.9–1.5 mm long, 0.8–1.8 mm across; lobes 5–6, triangular, 0.3–0.4 mm long; glands 4–6, 0.2–0.3 mm long, 0.5–0.8 mm wide;



Fig. 16. *Euphorbia papillifolia* var. *papillifolia*. A. habit $\times 0.5$. B. branchlet with cyathia $\times 6$. C. leaf $\times 6$. D. papillae on lower leaf surface $\times 32$. E. stipules $\times 24$. F. cyathia with female flower $\times 24$. G. cyathia with capsule $\times 12$. H. cyathial gland with appendage, adaxial view $\times 32$. I. capsule, top view $\times 12$. J. capsule, lateral view $\times 12$. All from Halford Q9771 & Guymer (BRI). Del. W. Smith.

gland appendages (0.1)0.4–0.9 mm long, 0.9–1.4 mm wide. **Staminate flowers** 15–30 per cyathium. **Pistillate flowers** with styles 0.5–0.7 mm long. $n = 11$.

Additional selected specimens examined: Queensland.

LEICHHARDT DISTRICT: Warren State Farm, Mar 1920, *Francis s.n.* (BRI [AQ202944]); Barfield, Jan 1945, *Scarlett S228* (BRI); 1.2 km along Lyndley Lane, N of Jimbour, Nov 1997, *Bean 12531* (BRI). **New South Wales.** Mt Russell, near Inverell, Dec 1915, *Breakwell s.n.* (NSW 614327); 9.3 km NE of Inverell on Nullamanna Road, May 1985, *Wilson 6178* (NSW); Inverell, Apr 1913, *Boorman s.n.* (NSW 612144); Sinclair Lookout, Waterloo Range, 14.4 km W of Glen Innes, Mar 1987, *Coveny 12489 et al.* (NSW); 40 km ENE of Narrabri, Sep 1976, *Hassall 7669* (BRI); entrance to Mt Kaputar N.P. on Dawsons Spring Road, 28 km ENE of Narrabri, Nov 1976, *Coveny 8893 & Roy* (NSW); Binnaway Road, 5 miles [c. 8 km] SSE of Coonabarabran, Jan 1962, *Salasoo 2313* (NSW); east facing slope to north of Dulegal Arboretum, Chaffey Dam, Feb 1993, *Hosking 688* (MEL); Kelso, Mar 1933, *McKie s.n.* (NSW 614324).

Distribution and habitat: *Euphorbia papillifolia* var. *polyandra* occurs from Springsure, Qld, south to the Bathurst district, NSW (**Map 40b**). It grows in grassy *Eucalyptus* woodland or *Themeda/Dichanthium* grassland on plains or undulating to hilly terrain. The soils are mostly red clay loams to black clays, rarely sandy. It is also recorded as a weed of cultivation.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia papillifolia* var. *polyandra* differs from the type variety in having generally larger gland appendages (0.4–0.9 × 0.9–1.4 mm versus 0.1–0.4 × 0.3–0.9 mm), more stamens per cyathia (15–30 versus 1–7), longer styles (0.5–0.7 mm long versus 0.3–0.5 mm long) and generally larger seeds (1.3–1.6 × 0.9–1 × 0.9–1 mm versus 1.3–1.4 × 0.7–0.9 × 0.8–0.9 mm).

Bentham (1873) cited a Dr Beckler collection from Warwick, Qld (MEL 68198) under *E. alsiniflora* with the comment that it appears to be the same species. The Beckler collection is here identified as *E. papillifolia* var. *polyandra*.

Hassall (1977) proposed the name *E. drummondii* subsp. *bleckeri* for this taxon but this name was never validly published.

Etymology: The varietal epithet is from Greek *polys*, many, and *andrus*, man (stamen), in reference to the many more stamens present per cyathia in this variety compared with the type variety.

41. *Euphorbia petala* Ewart & L.R.Kerr, *Proc. Roy. Soc. Victoria* 39: 1, fig. 1 (1926); *Chamaesyce petala* (Ewart & L.R.Kerr) P.I.Forst. & R.J.F.Hend., *Novon* 5: 323 (1995). **Type:** [Northern Territory.] Wycliffe Well, June 1924, [*A.J. Ewart s.n.*] (lecto [here designated]: MEL 1560387; isolecto: MEL 503409).

Illustration: Ewart & Kerr (1926: 2, fig 1).

Monoecious, herbaceous perennial, few to many stems arising from woody taproot, the whole plant glabrous. **Stems** prostrate, much branched, smooth. **Interpetiolar stipules** narrow-triangular to subulate, 0.6–1.5 mm long, bipartite, glabrous; margin laciniate. **Leaves:** petiole 0.5–0.8 mm long, smooth; blade oblong, obovate or elliptic, 6–11 mm long, 3–7 mm wide, 1.5–2.8 times longer than wide; adaxial surface pale blue-green or dull light green, smooth; abaxial surface similar to but paler than adaxial surface; base asymmetric with one side auriculate to cordate, the other shallowly cordate to rounded; margin serrulate or sparingly minutely toothed; apex rounded to shallowly retuse. **Cyathia** solitary at the nodes, often gathered together on short leafy lateral branchlets with subtending leaves usually slightly smaller than primary stem leaves; peduncles 0.2–0.8(1.2) mm long, smooth. **Involucres** campanulate or turbinate, 1.1–1.5 mm long, 1–1.2 mm across; lobes 5, triangular, 0.3–0.5 mm long, margin entire or fimbriate; glands 4, stipitate, patelliform, concave, or cupuliform with central tangential pit, transverse-oblong in outline, 0.1–0.5 mm long, 0.4–0.5 mm wide, pink or red; gland appendages conspicuous, spreading radially, obdeltoid, 0.3–1.3 mm long, 1.1–2 mm wide, pink or white, glabrous, margin irregularly toothed or shallowly lobed distally; bracteoles 0.7–0.8 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into few to numerous, subulate glabrous segments. **Staminate flowers** 7–10 per cyathium; pedicels 0.9–1.3 mm long; staminal filaments

c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.5 mm long, spreading, smooth, glabrous, each entire or scarcely bifid, the apices terete. **Capsules** exserted from involucre on pedicel to 2.5 mm long, broad to very broad-ovate in lateral view, 1.7–1.8 mm long, 1.7–2 mm across, shallowly 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, 1–1.2 mm long, 0.6–0.7 mm tangentially, 0.6–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar or convex; ventral faces concave; all faces with faint narrow irregular ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown or red-brown. **Fig. 27K.**

Additional selected specimens examined: Northern Territory. Panu Panu Soakage, near Lake Surprise, Aug 1991, *Latz 12135* (DNA, MEL); 50 km W of Newcastle Waters homestead, Feb 1989, *Thomson 3187* (DNA); 60 km NE [of] Bob Well, Lander River, Jul 1989, *Latz 11556* (MEL); 11.4 km N of Elliot on Stuart Highway, Apr 1983, *Barker 194* (AD, NSW); 32 km S [of] Elliott on Stuart Highway, Mar 1991, *Thomson 3450* (DNA); 8 km N [of] Renner Springs, Stuart Highway, Feb 1988, *Thomson 2240* (DNA); 40 km ESE [of] Barrow Creek, May 1996, *Albrecht 7563 & Latz* (DNA); Elkedra Station, 7 km NW of homestead on road to Hatches Creek via jump-up, Aug 1979, *Morton 210* (DNA, MEL); Little Lagoon, Groote Eylandt, Apr 1948, *Specht 220* (AD, BRI, MEL, NSW); Calvert River mouth, Jun 1987, *Thomson 1894* (DNA); Old Highland Plains, Jul 1971, *Latz 1741* (DNA). **Queensland.** BURKE DISTRICT: Nicholson River crossing, 3 km E of Doomadgee, Jun 1991, *Halford Q607* (BRI); Musselbrook Creek Gorge, 27.6 km (by road) NE of Musselbrook Mining Camp, 175 km N of Camooweal – Lawn Hill N.P., Apr 1995, *Johnson MRS598 & Thomas* (BRI); 88.5 km along Richmond Road, 0.7 km S of Prospect Station turnoff, Esmeralda Station, Apr 2007, *McDonald KRM6433* (BRI); Paradise Swamp, c. 10 km NW of Burke & Wills Roadhouse and N of the Burketown Development Road, Feb 2006, *Fox IDF3904 & Wilson* (BRI); Richmond – Croydon Road, 109.0 km from Richmond, Jul 1998, *Bean I3409* (BRI); Bunda Bunda, NE of Julia Creek, Apr 1999, *Fensham 3759* (BRI). NORTH KENNEDY DISTRICT: 29 km S of Yarrowmere homestead on track to Bowie homestead, Whistling Duck Creek, Apr 2006, *Halford Q9035a & Batianoff* (BRI). SOUTH KENNEDY DISTRICT: c. 18 km of Moonoomoo Station on road to Yarrowmere Station from Bowie Station, Oct 1983, *Henderson H2804 et al.* (BRI).

Distribution and habitat: *Euphorbia petala* occurs from Groote Eylandt, Newcastle Waters and Lake Surprise in NT, eastward to Charter Towers and near Aramac, north

Qld (**Map 41**). It grows in *Triodia* grassland or open eucalypt/melaleuca woodland/open forest on sand plains, sandstone rises, inland sand dunes or sandy river terraces. It has also been recorded in low monsoon forest. The soils are sandy to sandy loam.

Phenology: Flowers and fruits have been collected from February to October.

Typification: There are two sheets [1560387 & 503409] at MEL collected by Ewart at Wycliffe Well in June 1924 and annotated with the name *E. petala* that qualify as syntypes of *E. petala*. The sheet MEL 1560387 is the more ample specimen and is selected here as lectotype of the name.

Notes: *Euphorbia petala* is similar to *E. albrechtii*, *E. cinerea* and *E. ophiolitica*. For features distinguishing *E. petala* from *E. albrechtii* and *E. cinerea*, refer to the 'Notes' section under *E. albrechtii*.

42. *Euphorbia philochalix* Halford & W.K.Harris, **species nova** quoad habitum generali et formam seminis capsulaeque similis *E. verrucitestae* Halford & W.K.Harris sed ab ea glandulae appendicibus longioribus 0.1–0.3 mm longis (ad vicem appendicibus c. 0.5 mm longis), seminibus 0.9–1.1 mm longis interdum brevibus (ad vicem seminibus 1.1–1.2(1.3) mm longis), seminum superficiebus porcis prominentibus angustis praeditis irregularis (ad vicem superficiebus verrucosis) distinguenda. *Euphorbia philochalix* quondam putabatur eadem *E. drummondii* Boiss. esse sed seminum superficiebus irregulariter porcatis (ad vicem superficiebus porcis 3–6 distinctis transversis), capsulis latis usque perlatis 1.3–1.5(1.8) × 1.5–1.8(2.1) mm plerumque minoribus (ad vicem capsulis 1.6–1.8 × 1.7–1.9 mm), seminibus late obovatis (ad vicem seminibus oblongo-ovatis), stylis bifidis 1/3–1/2 longitudinis (ad vicem stylis integris vel vix bifidis) differt. **Typus:** Western Australia. 37 km S of Denham, 24 May 1991, *B.G.Thomson 3515* (holo: DNA; iso: NT, according to label information on the holotype sheet there are duplicates (isotypes) lodged at PERTH *n.v.*, K *n.v.*).

Monoecious, annual to 15 cm high, many stems arising from slender taproot, the whole plant glabrous. **Stems** prostrate or ascending, much branched, smooth or often longitudinally ridged. **Interpetiolar stipules** narrow-triangular, 0.9–1.2 mm long, bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.1–1 mm long, smooth; blade obovate or elliptic, 4.3–6.7 mm long, 2.3–4.2 mm wide, 1.2–1.9 times longer than wide; adaxial and abaxial surfaces green sometimes with reddish tinge especially along margins, smooth or minutely papillose; base symmetric, obtuse to cuneate or asymmetrical with one side cordate, the other obtuse or rounded; margin entire or sparingly minutely toothed distally; apex retuse or rounded. **Cyathia** solitary at the nodes, peduncles 0.3–0.5 mm long. **Involucres** campanulate or turbinate, 0.8–1.1 mm long, 0.9–1.2 mm across; lobes 5, triangular, 0.4–0.6 mm long, margin entire or fimbriate; glands 4, stipitate, cupuliform, with shallow central pit and somewhat thickened rim, transverse-oblong in outline, 0.1–0.3 mm long, 0.2–0.5 mm wide, pink or red; gland appendages conspicuous, spreading radially, obdeltoid or oblong, 0.1–0.3 mm long, 0.5–0.7 mm wide, pink, glabrous, margin entire, crenulate or shallowly irregularly lobed; bracteoles 0.8–1.1 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into few subulate hirsute segments. **Staminate flowers** 5–10 per cyathium; pedicels 1–1.5 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.3–0.5 mm long, spreading or ascending, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices stout terete. **Capsules** exserted from involucre on pedicel to 2 mm long, broad to very broad-ovate in lateral view, 1.3–1.5 mm long, 1.6–1.8 mm across, shallowly 3-lobate with keels acute, smooth, glabrous; hypogynous disc entire. **Seeds** broad-ovate in outline, 0.9–1.1 mm long, 0.6–0.8 mm tangentially, 0.6–0.8 mm radially, tetraquetrous in cross section; dorsal and ventral faces concave, with prominent irregular rounded ridges; exotesta thin, of even thickness over surface, white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown. *n* = 11. **Figs 17, 27L.**

Additional selected specimens examined: **Western Australia.** c. 8.5 km S of Useless Loop township and Trig Station, Shark Bay, Oct 1997, *Markey 1563* (PERTH); Salutation Island, Freycinet Estuary, Shark Bay, Sep 1989, *Alford 1316* (PERTH); 1 mile [c. 1.6 km] S of Useless Loop, Aug 1970, *Aplin 3386* (PERTH); Three Bay Island, Shark Bay, Sep 1989, *Alford 1285* (PERTH); Baudin Island, Freycinet Estuary, Shark Bay, Sep 1989, *Alford s.n.* (PERTH 4591437); 15 miles [c. 24 km] W of Wiluna, Aug 1973, *Hassall 73101* (BRI); Kalbarri N.P., Aug 1994, *Cranfield 9272* (PERTH); [Houtman] Abrolhos Islands, Nov 1897, *Helms s.n.* (PERTH 2436752, 2436817); Little Rat Island, Easter Group, Abrolhos Islands, Nov 1999, *Harvey s.n.* (PERTH 6228739); Sachse Property, Snake Soak, Sep 2002, *Davis WW76-35* (PERTH); c. 15 km SE of Bonnie Rock, Sep 2001, *Sage WW43-33 et al.* (PERTH); c. 18.2 km NNW of Mt Dimer, Hunt Range, Jaurdi Station, Jul 1995, *Gibson 3708 & Lyons* (PERTH); 50 miles [c. 80 km] N of Kalgoorlie, Aug 1973, *Hassall 73100* (BRI); 17 miles [c. 27 km] N of Kalgoorlie, Aug 1973, *Hassall 7398* (BRI)[mixed collection with *E. multifaria*]; near Broad Arrow, 38 km N of Kalgoorlie, Sep 1927, *Gardner & Blackall s.n.* (PERTH 2437201). **Northern Territory.** Old Curtain Springs homestead, SW Mt Connor, Sep 1986, *Thomson 1442* (DNA) [mixed collection with *E. porcata*].

Distribution and habitat: *Euphorbia philochalix* occurs from Shark Bay and the Houtman Abrolhos Islands, east to near Kalgoorlie, WA, with a disjunct population near Mt Connor in southern NT (**Map 42**). It grows in low shrubland or low eucalypt open woodland communities on sand dunes, gentle undulating terrain or limestone rises. The soils are mostly brown to red sands or sandy clays, often over limestone.

Phenology: Flowers and fruits have been collected from May to November.

Notes: *Euphorbia philochalix* is similar to *E. verrucitesta* in its general habit, and seed and capsule shape. It may be distinguished from that species by its longer gland appendages (0.1–0.3 mm long versus c. 0.5 mm long for *E. verrucitesta*), generally shorter seeds (0.9–1.1 mm long versus 1.1–1.2(1.3) mm long for *E. verrucitesta*) and prominent narrow irregular ridged seed surfaces (versus irregular wart-like protuberances on the seed surface for *E. verrucitesta*).

Euphorbia philochalix has previously been identified as *E. drummondii*, but differs from that species in having prominent irregularly ridged seed surfaces (versus seed surfaces

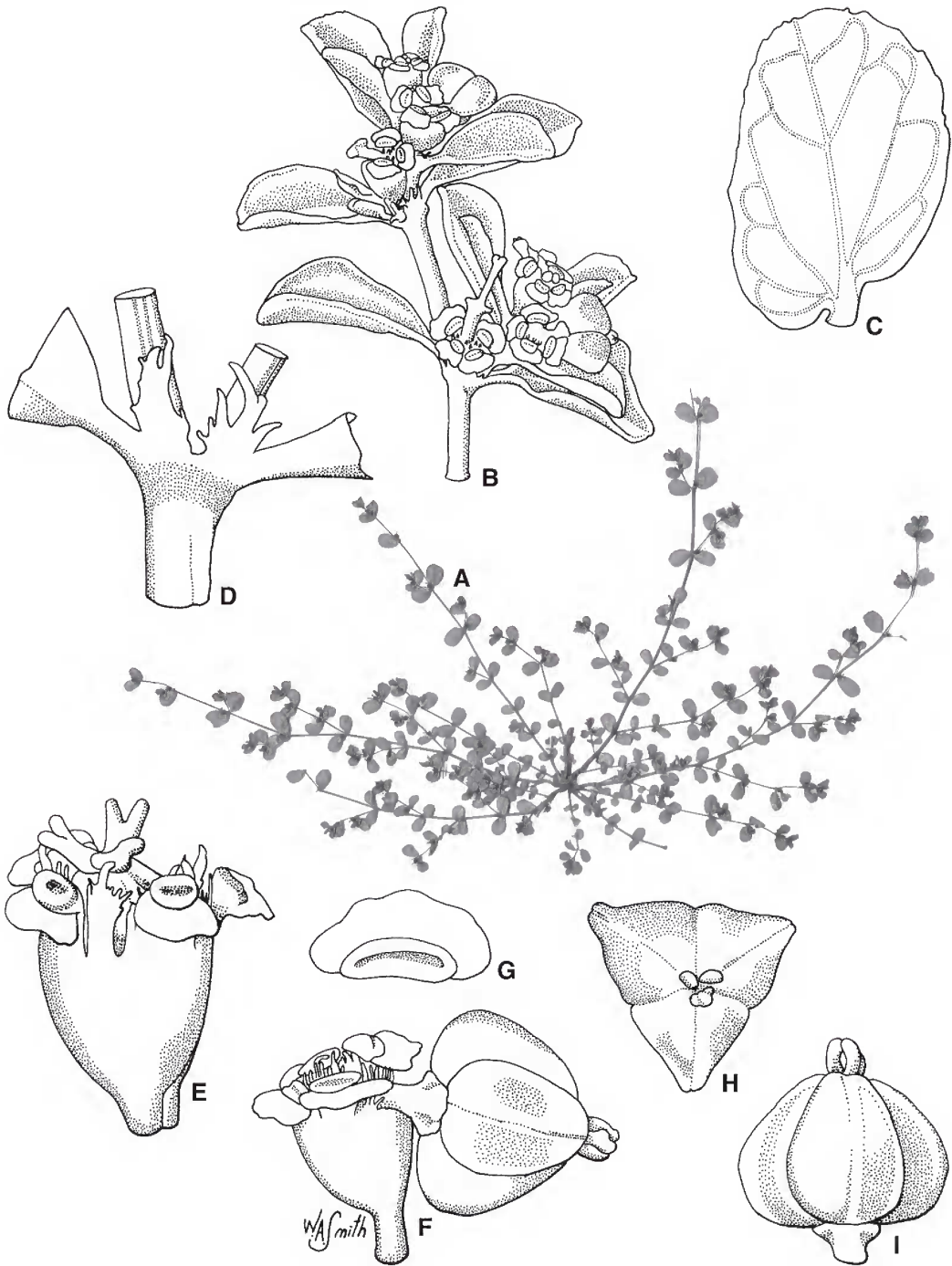


Fig. 17. *Euphorbia philochalix*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 6$. C. leaf $\times 8$. D. stipules $\times 16$. E. cyathia with female flower $\times 24$. F. cyathia with fruit $\times 16$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A from Thomson 3515 (DNA); B–C, & F–I from Alford 1285 (PERTH); E from Hassall 73100 (BRI). Del. W. Smith

with 3–6 distinct transverse ridges for *E. drummondii*), capsules broad to very broad ovate in outline which are generally smaller in dimensions $(1.3\text{--}1.5(1.8) \times 1.5\text{--}1.8(2.1)$ mm versus broadly elliptic in outline, $1.6\text{--}1.8 \times 1.7\text{--}1.9$ mm for *E. drummondii*), seeds broad-obovate in outline (versus oblong-obovate for *E. drummondii*) and styles that are bifid for $1/3\text{--}1/2$ of their length (versus style entire or scarcely bifid for *E. drummondii*).

Etymology: The specific epithet is a noun in apposition and is from Greek *philo-*, loving, fond of, and *chalis*, calcium, in reference to the usual habitat of this species, namely on soils associated with limestone.

43. Euphorbia porcata Halford & W.K.Harris, **species nova** quondam putabatur eadem *E. drummondii* Boiss. esse sed superficie dorsalis seminis porca irregulari longitudinali in medio praedita superficie ventrali seminis \pm laevis (ad vicem superficiebus seminis porcis 3–6 distinctis transversis), glandulis involucrelibus $0.1\text{--}0.15 \times 0.1\text{--}0.2$ mm sine ore incrassata (ad vicem glandulis $0.15\text{--}2 \times 0.2\text{--}0.4$ mm) differt. Saepe dicitur *E. porcata* cum *E. ferdinandi* Baill. var. *ferdinandi* crescat sed stylis $1/3\text{--}1/2$ longitudinis bifidis (ad vicem stylis integris vel vix bifidis), glandulis involucrelibus sine ore incrassato seminis superficie dorsali porca longitudinali irregulari ad medio praedita (ad vicem superficie laevi), capsulis longitudine latitudine aequa perlato-ovatis vel lato-ellipticis a latere visus $1.4\text{--}2 \times 1.4\text{--}2$ mm (ad vicem capsulis $1.4\text{--}1.9 \times 1.3\text{--}1.7$ mm) distinguenda. **Typus:** Queensland. GREGORY NORTH DISTRICT: Ethabuka Station, c. 3 km S of homestead, 112 km NW of Bedourie, 26 June 2010, *D.Halford QM84 & P.I.Forster* (holo: BRI, iso: AD, DNA, NSW, PERTH, *distribuendi*).

Monoecious, annual or herbaceous perennial with thickened woody taproot, to 30 cm high, many stems arising from rootstock, the whole plant glabrous. **Stems** mostly prostrate or ascending, sometimes erect, much branched, smooth. **Interpetiolar stipules** narrow-triangular, $0.5\text{--}1.1$ mm long, bipartite, glabrous; margin serrulate or lacinate. **Leaves:** petiole c. 0.2 mm long, smooth; blade

oblong or oblanceolate, 4–8 mm long, 2–5 mm wide, 1.6–2.4 times longer than wide; adaxial surface pale green or reddish green, smooth (rarely minutely papillose); abaxial surface similar to but paler than adaxial surface; base asymmetric with one side cordate or truncate, the other cuneate or obtuse; margin serrulate or sparingly minutely toothed; apex retuse or rounded. **Cyathia** solitary at the nodes, sometimes gathered together on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles c. 0.2 mm long, smooth. **Involucres** turbinate, $0.5\text{--}0.8$ mm long, $0.6\text{--}0.8$ mm across; lobes 5, triangular, $0.2\text{--}0.3$ mm long, margin entire; glands 4, stipitate, cupuliform, with distinct central pit, transverse-oblong to orbicular in outline, $0.1\text{--}0.15$ mm long, $0.1\text{--}0.2$ mm wide, red; gland appendages inconspicuous or absent, spreading radially, transverse-linear, $0.05\text{--}0.15$ mm long, c. 0.2 mm wide, pink, glabrous, margin entire; bracteoles $0.5\text{--}0.7$ mm long, adnate for $1/3\text{--}1/2$ of their length to involucre, free portion entire or divided into few to numerous subulate glabrous segments. **Staminate flowers** 3–10 per cyathium; pedicels $0.6\text{--}1.1$ mm long; staminal filaments 0.15 mm long. **Pistillate flowers:** styles $0.2\text{--}0.4$ mm long, spreading, recurved distally, smooth, glabrous, each bifid for $1/3\text{--}1/2$ of their length, the apices slender and terete or stout and clavate. **Capsules** exerted from involucre on pedicel to 1.3 mm long, very broad-ovate or broad-elliptic in lateral view, $1.4\text{--}2$ mm long; $1.4\text{--}2$ mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate in outline, $1\text{--}1.3$ mm long, $0.5\text{--}0.7$ mm tangentially, $0.6\text{--}0.7$ mm radially, tetraquetrous in cross section; dorsal faces convex or concave, with \pm medial longitudinal irregular ridge; ventral faces concave, usually smooth or faintly irregularly ridged; exotesta thin, of even thickness over surface, white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta pale brown to red-brown. $n = 11$. **Figs 18, 27M.**

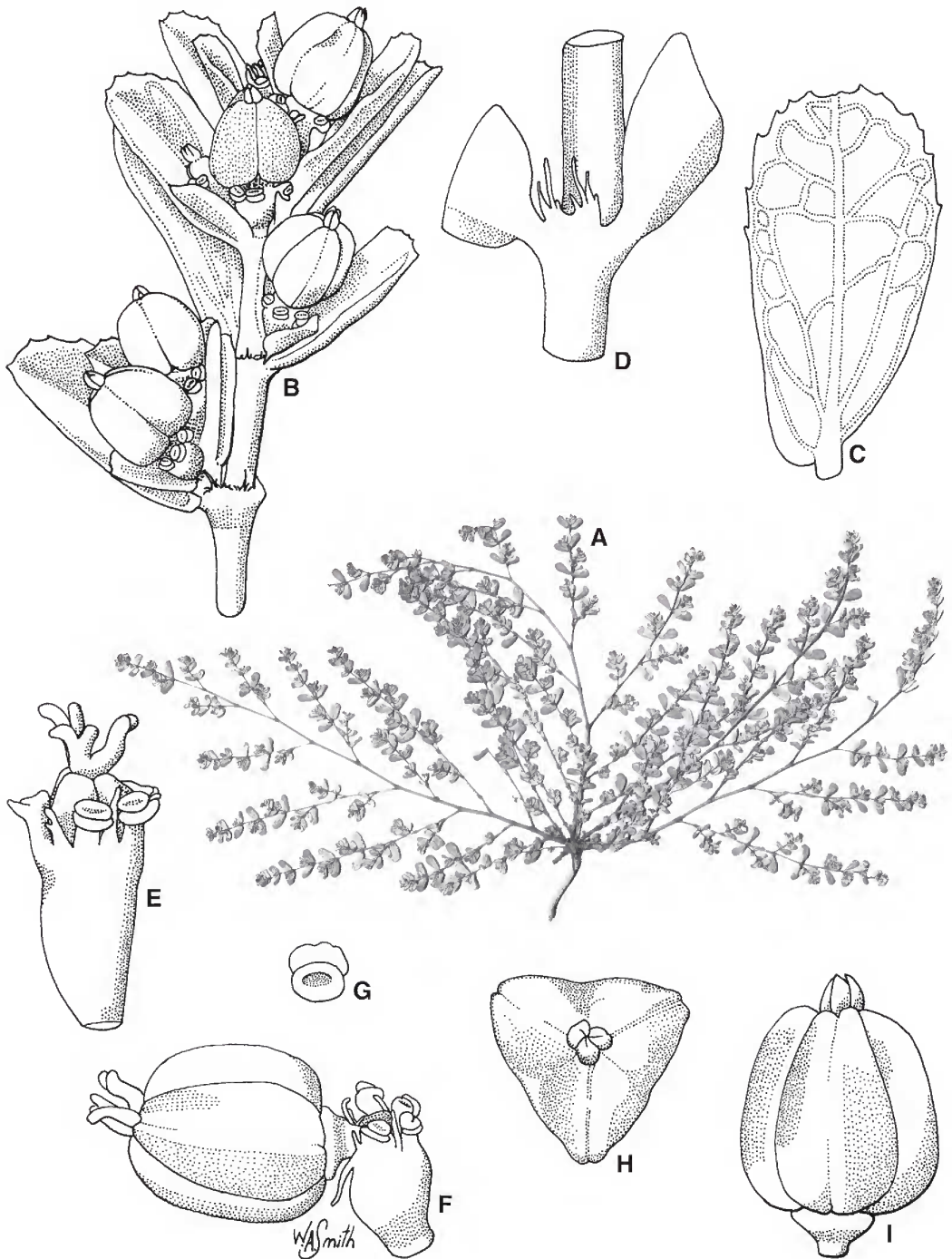


Fig. 18. *Euphorbia porcata*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. stipules $\times 12$. E. cyathia with female flower $\times 24$. F. cyathia with fruit $\times 16$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A from Halford QM9 & Forster (BRI); B–I from Halford QM30 & Forster (BRI). Del.W. Smith.

Additional selected specimens examined: **Western Australia.** 18 km N of Overlander Roadhouse on North West Coastal Highway, c. 33 km S of Gladstone, Sep 1985, *Wilson 12201* (BRI, PERTH); 42 km from Agnew along road to Wiluna, Sep 1982, *Strid 20156* (PERTH); Damboring, c. 46 km N of Wongan Hills, Mar 1968, *Wilson 6488* (PERTH); Rundall River N.P., Little Sandy Desert, Apr 1979, *Mitchell 873* (DNA). **Northern Territory.** 46 km N [of] Three-Ways; Stuart Highway, Feb 1988, *Thomson 2241* (DNA); Stirling Bore, 20 miles [c. 32 km] S of Barrow Creek township, Sep 1955, *Perry 5345* (BRI, DNA, MEL, NSW); George Gill Range, Stokes Creek, Oct 1986, *Thomson 1534* (DNA); Maryvale Station, junction of Blackhill Bore and Maryvale Road, Aug 1988 *Barritt 745* (DNA); Armata Road, 27 km S [of] t/off from old road to Uluru, Apr 1988, *Thomson 2298* (DNA). **Queensland.** GREGORY NORTH DISTRICT: Cravens Peak, 194 km by road SW of Boulia, Painted Gorge, 12 km by road S of 12 Mile Bore, Apr 2007, *Thomas 3505 & Turpin* (BRI); Cravens Peak, 13.6 km S along shotline track from Ocean Bore – Painted Gorge Track, 135 km SW of Boulia, Jun 2010, *Halford QM9 & Forster* (BRI); c. 33 km N of Bedourie on road (Diamantina Development Road) to Boulia, Jun 2010, *Halford QM30 & Forster* (BRI). WARREGO DISTRICT: 75 km NW of Charleville on road to Adavale, Sep 2005, *Halford Q8594 & Thomas* (BRI). GREGORY SOUTH DISTRICT: 25 miles [c. 40 km] E of Birdsville, May 1975, *Hassall 7521* (BRI); 3 miles [c. 4.8 km] N of Santos, May 1973, *Hassall 7343* (BRI). **South Australia.** Dulkaninna Station, Apr 1997, *Smyth 48* (AD, MEL); Dularangi, May 1986, *Conrick 2057* (AD); Arabana Hill, 2 km N of Lake Arthur, Mar 1987, *Badman 1960* (AD); 0.5 miles [c. 800 m] SW of Hawker Gate, on Quinyambie Station, Jun 1955, *Johnson 970 & Constable* (NSW). **New South Wales.** Cameron Corner, Sturt N.P., Sep 1989, *Wiecek 250 et al.* (BRI, NSW); 1.5 km NE of Joulmie homestead, May 1973, *Hassall 7318* (BRI); W bank of the salt lake, 45 km SSE of Milparinka, Sep 1971, *DeNardi 822* (AD, NSW); S shore of Menindee Lake, Kinchega N.P., Jun 1984, *Dalby 84/06* (NSW).

Distribution and habitat: *Euphorbia porcata* is widespread across the arid zone in Australia where it extends from WA, through SA and the southern part of the NT to south-western Qld and western NSW (**Map 43**).

It is recorded growing on sand dunes, floodouts or in drainage lines or dune swales, in hummock grassland, *Acacia* spp. shrubland/woodland or *Eucalyptus* spp. woodland communities, on mostly sandy to sandy loam soils.

Phenology: Flowers and fruits have been collected throughout the year, particularly from April to October.

Notes: *Euphorbia porcata* has previously been identified as *E. drummondii*, but differs from

that species in its dorsal seed surface having a medial longitudinal irregular ridge and the ventral seed surface \pm smooth (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*), and smaller involucre glands that lack a thickened rim ($0.1\text{--}0.15 \times 0.1\text{--}0.2$ mm versus $0.15\text{--}0.2 \times 0.2\text{--}0.4$ mm for *E. drummondii*).

Euphorbiaporcata has often been recorded growing with *E. ferdinandi* var. *ferdinandi*. It is distinguished from that species by its divided styles (styles bifid for 1/3–1/2 of their length versus entire or scarcely bifid for *E. ferdinandi* var. *ferdinandi*), involucre glands lacking a thickened rim, dorsal seed surface having a medial longitudinal irregular ridge (versus seed surface smooth for *E. ferdinandi* var. *ferdinandi*) and capsules as wide as long (very broad-ovate or broad-elliptic in lateral view, $1.4\text{--}2$ mm \times $1.4\text{--}2$ mm versus elliptic in lateral view, $1.4\text{--}1.9 \times 1.3\text{--}1.7$ mm for *E. ferdinandi* var. *ferdinandi*).

The seeds are more or less uniform over the eastern part of the species range. The collections seen of this species from WA have slightly shorter seeds with a more well defined medial longitudinal ridge. Further collections and field studies are warranted to establish the significance of this variation.

Etymology: The specific epithet is from Latin *porcatus*, ridged, in reference to the irregular longitudinal medial ridge along the dorsal faces of the seeds of this species.

44. *Euphorbia prostrata Aiton, *Hort. Kew.* 2: 139 (1789); *Chamaesyce prostrata* (Aiton) Small, *Fl. S.E. U.S. [Small]* 713, 1333 (1903). **Type:** cultivated at Kew, origin in the West Indies, in 1758, *P. Miller s.n.* (holo: BM 510671, *n.v.*).

Illustrations: Auld & Medd (1987: 161); Carter (1988: 422, fig. 78, 2); James & Harden (1990: 428) as *Chamaesyce prostrata*; Lin *et al.* (1991: 244, fig. 18), as *Chamaesyce prostrata*.

Monoecious, annual to 5 cm high, many stems arising from slender taproot. **Stems** prostrate to weakly ascending, much branched, smooth, with moderately dense to dense

indumentum in a longitudinal band; hairs spreading, straight to recurved, to 0.3 mm long. **Interpetiolar stipules** narrow-triangular to triangular, 0.3–1 mm long, bipartite or entire, glabrous or occasionally with scattered hairs; margin lacinate or obscurely toothed. **Leaves:** petiole 0.4–1 mm long, smooth, glabrous or nearly so; blade oblong, elliptic or rotund, 2.2–8.5 mm long, 1.2–4.5 mm wide, 1.5–2 times longer than wide; adaxial surface green to blue-green occasionally with reddish tinge along margin, smooth, glabrous; abaxial surface grey-green occasionally with reddish tinge along the midline, smooth, glabrous or with sparse to moderately dense indumentum consisting of spreading hairs 0.1–0.3 mm long; base asymmetric with one side shallowly cordate, the other rounded; margin sparingly minutely toothed; apex acute to rounded. **Cyathia** solitary at the nodes, often gathered together on short leafy lateral branchlets with subtending leaves usually slightly smaller than primary stem leaves; peduncles 0.5–2.5 mm long, smooth, glabrous. **Involucres** turbinate, 0.5–0.7 mm long, 0.4–0.6 mm across; lobes 5, triangular, 0.1–0.2 mm long, margin fimbriate; glands 4, stipitate, patelliform or cupuliform, with a tangential trough or distinct central pit with a somewhat thickened rim, transverse-oblong to orbicular in outline, 0.05–0.1 mm long, 0.1–0.3 mm wide, red or reddish-purple; gland appendages conspicuous, spreading radially, transverse-oblong, 0.05–0.1 mm long, 0.1–0.2 mm wide, pink, red or white, glabrous, margin entire or undulate; bracteoles filamentous, 0.4–0.5 mm long, glabrous. **Staminate flowers** 3–5 per cyathium; pedicels 0.5–0.7 mm long; staminal filaments *c.* 0.1 mm long. **Pistillate flowers:** styles 0.2–0.3 mm long, erect to spreading, recurved distally, smooth, glabrous, each bifid for *c.* 1/2 of their length, the apices clavate. **Capsules** exserted from involucre on pedicel to 2 mm long, broad to very broad-ovate in lateral view, 1–1.5 mm long, 1.1–1.5 mm across, shallowly 3-lobate with keels acute, smooth, with a sparse to moderately dense indumentum mostly confined to the keels; hairs spreading, 0.1–0.2(0.5) mm long; hypogynous disc entire. **Seeds** ovate in outline, 0.8–1 mm long, 0.5–0.6 mm tangentially,

0.4–0.6 mm radially, tetraquetrous in cross section; dorsal and ventral faces \pm planar, with 4–7 distinct transverse acute ridges; exotesta thin, of even thickness over surface, pale brown or grey-white, microreticulate or microgranulate especially on ridge crests, becoming mucilaginous (very thin layer) when moistened; endotesta pale brown. **Fig. 27N.**

Additional selected specimens examined: **Western Australia.** near work shed, Karijini Ranger Station, Karijini N.P., Sep 2006, *Halford Q9213* (BRI, PERTH); Naval Base, Fremantle to Rockingham, Jan 1984, *Keighery 6533* (PERTH); roadside (W) on causeway N end, W of T27 electricity pole, Garden Island, Jul 2003, *Dodd 847* (PERTH); 2.5 km W of Mundijong, junction Mundijong and Kargotich Roads, Mar 1999, *Davis 8796* (BRI, PERTH); corner of Kargotich & Mundijong Roads, Mundijong, May 2009, *Hislop 3878* (BRI, MICH). **Northern Territory.** Camfield Station homestead, Jul 1983, *Kernot s.n.* (DNA [D0024788]); Brunette Downs Station, Apr 1988, *Kimbel 34* (DNA); Tangentyere Nursery, Alice Springs, Nov 1995, *Albrecht 7079* (DNA). **Queensland.** COOK DISTRICT: Boigu Island, *c.* 8 km S of PNG mainland, Oct 1992, *Waterhouse BMW1444* (BRI). BURKE DISTRICT: Palm Grove, Lawn Hill N.P., May 1990, *Latz 11635* (DNA). LEICHHARDT DISTRICT: Charles Street, Springsure, Aug 2004, *Halford Q8320* (BRI); Leichhardt Hotel, Taroom, Mar 2004, *Halford Q8189 & Edginton* (BRI). PORT CURTIS DISTRICT: Raglan Creek crossing, 21 km W of Mt Larcom, Nov 2003, *Halford Q8066 & Forster* (BRI). BURNETT DISTRICT: Lions Park, Kingaroy Street, Kingaroy, Mar 2004, *Halford Q8171 & Edginton* (BRI). MORETON DISTRICT: Peregrine Beach, Avocet Parade, Jan 2000, *Harris 112* (BRI); Guanaba, Coomera River, 5 km SW of Oxenford, property of I. Cairns, Apr 2003, *Forster PIF29296* (BRI). **New South Wales.** Kyogle District, Dec 1957, *Vane s.n.* (NSW 541519); Lismore, Mar 1957, *Flynn s.n.* (NSW 612664); Narrabri Golf Club, 1996, *s.coll.* (NSW 398987); Bective Travelling Stock Route, alongside Peel River, Jan 1995, *Hosking 1074 & Sullivan* (NSW, MEL); Tamworth Regional Botanic Gardens, Oxley Park, Tamworth, Mar 1999, *Hosking 1692 & Bayliss* (MEL, NSW); Strathfield, Mar 1954, *Ford s.n.* (NSW 612601).

Distribution and habitat: *Euphorbia prostrata* is a native to tropical and subtropical America now naturalised throughout much of the warmer regions of the world, including Australia. In Australia it is common in urban centres in coastal and subcoastal parts of Qld and NSW, with scattered occurrences through north-western Qld, NT and in the Pilbara and Perth regions, WA (**Map 44**). It grows in sunny situations on disturbed open ground, road sides, river banks, lawns, garden beds and in cracks of footpaths.

Phenology: Flowers and fruits have been collected throughout the year, particularly from January to March.

Notes: In Australia, *Euphorbia prostrata* has been confused with *E. maculata* and *E. australis*. *E. prostrata* is easily distinguished by having capsules sparsely to moderately densely hairy along the keels and more or less glabrous between the keels, and seed surface with 4–7 distinct transverse acute ridges.

There are two forms of this naturalised species in Australia. The most common and widespread form has a slender habit with hairs c. 0.2 mm long on the stems and the leaves are \pm glabrous except for a few scattered hairs on the abaxial surface and along the margins. The second form has a more robust habit with hairs up to 0.3 mm long on the stems and the leaves have a sparse to moderately dense indumentum consisting of spreading, hairs 0.1–0.3 mm long. The longer indumentum gives the plants a shaggy appearance. This second form is recorded in the Perth region, WA (e.g. *Davis 8796*, *Keighery 6533*, *Hislop 3878*) and at a single locality near Wandoan, Qld (90 km NW of Wandoan, Jan 2005, *Ward s.n.* [BRI (AQ723922)]).

45. *Euphorbia psammogeton* P.S.Green, *Kew Bull.* 48: 314 (1993); *Chamaesyce psammogeton* (P.S.Green) P.I.Forst. & R.J.F.Hend., *Novon* 5: 323 (1995). **Type:** [New South Wales.] Lord Howe Island, Blinky Beach, 13 November 1963, *P.S.Green 1625* (holo: K 186489).

Euphorbia atoto var. *imbricata* Boiss., in A.DC., *Prodr.* 15(2): 13 (1862). **Type:** [Queensland. PORT CURTIS DISTRICT:] Port Curtis, November 1847, [*J.*] *Macgillivray B65* (holo: K).

Illustrations: Stanley & Ross (1983: 414, fig. 65B), as *E. sparrmannii*; James & Harden (1990: 429), as *Chamaesyce sparrmannii*; Green (1993: 315, fig. 2, A1–5; 1994: 236, fig. 47, A–D).

Monoecious, herbaceous perennial, to 35 cm high, few to many stems arising from woody taproot. **Stems** prostrate or ascending to erect, sparingly to much branched, smooth,

glabrous. **Interpetiolar stipules** triangular to broad-triangular, 1–2 mm long, entire or bifid to bipartite, glabrous abaxially, hairy adaxially with conspicuous ascending white hairs to 0.15 mm long; margin irregularly serrulate.

Leaves: petiole 2–3 mm long, smooth; blade obovate, elliptic or oblong-elliptic, 12–28 mm long, 5–17 mm wide, 1.3–2.4 times longer than wide; adaxial surface green, blue-green or grey-green, smooth, glabrous; abaxial surface similar to but paler than adaxial surface; base asymmetric with one side cordate, the other rounded; margin sparingly minutely toothed or entire; apex obtuse to rounded.

Cyathia in congested 4–6 branched dichasial cymes together with a solitary cyathium at the distal nodes; peduncles 4–15 mm long; bracts leaf-like but smaller than the primary stem leaves; cyathial peduncles 1–3(6) mm long. **Involucres** turbinate, 1.5–2 mm long, 1.5–2 mm across; lobes 5, triangular, 0.4–0.8 mm long, margin entire or laciniate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, 0.4–0.5 mm long, 0.7–1 mm wide, pale green; gland appendages conspicuous, spreading radially, transverse-linear or lunate, 0.2–0.4 mm long, 0.6–1.3 mm wide, white, glabrous, margin entire; bracteoles 0.9–1.2 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into numerous \pm linear hirsute segments. **Staminate flowers** (2)5–10(20) per cyathium; pedicels 0.9–1.6 mm long; staminal filaments 0.3–0.5 mm long. **Pistillate flowers:** styles 0.7–0.8 mm long, spreading, recurved distally, smooth and glabrous, each bifid for c. 1/2 of their length, the apices terete. **Capsules** exserted from involucre to 3.5 mm long, very broad-ovate in lateral view, 2.8–3 mm long, 3.5–3.9 mm across, shallowly or deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** orbicular or very broad-ovate in outline, 1.5–1.8 mm long, 1.4–1.5 mm tangentially, 1.4–1.6 mm radially, \pm suborbicular or somewhat trigonal in cross section; ventral and dorsal faces convex, with irregular narrow rounded ridges; exotesta thin, of even thickness over surface, white, microreticulate, not becoming mucilaginous when moistened; endotesta red-brown. *n* = 8. **Fig. 270.**

Additional selected specimens examined: Queensland.

SOUTH KENNEDY DISTRICT: Eimeo Beach, c. 10 km N of Mackay, Aug 1976, *Henderson H2400* (BRI). PORT CURTIS DISTRICT: Freshwater Creek, Shoalwater Bay Training Area, Nov 2001, *Denley Samp55* (BRI); beach between Emu Point and Rocky Point at Emu Park, Jul 1977, *Batianoff & McDonald 109* (BRI); Deepwater N.P., 40 km E of Miriam Vale, Oct 1989, *Gibson TO1868* (BRI). WIDE BAY DISTRICT: Coonarr Beach, SE of Bundaberg, Nov 1996, *Bean 11243* (BRI); Woodgate, Sep 2004, *Halford Q8340a* (BRI, MEL, NSW). MORETON DISTRICT: Bishop Island, E of Brisbane, Apr 1932, *Blake 3336 & Everist* (BRI); Hercules Bank, S of Brisbane River, Jul 1930, *Hubbard 3487* (BRI); unnamed island between Tiger Mullet Channel and Whalleys Gutter, c. 6.5 km ENE of Jacobs Well, Sep 2003, *Halford Q7915 & Batianoff* (BRI). **New South Wales.** Fingal Point [Head], c. 2.5 miles [c. 4 km] SE of Tweed Heads, Jun 1962, *Constable 3050* (NSW); Angourie – Headland S of blue pools small path, Yurigu N.P., Sep 1993, *Clemesha s.n.* (NSW 279169); S of Woolgoolga – Headland, Jan 1971, *Whaite & Whaite 3471* (NSW); Lord Howe Island, North Beach, Mar 1971, *Rodd 1759* (NSW); Lord Howe Island, Blinky Beach, Mar 2001, *Le Cussan 1123* (BRI); Big Gibber, Myall Lakes, E of Bombah Point, Feb 1969, *Blaxell 207* (NSW); Wamberal Beach, c. 10 km E of Gosford, Aug 1985, *Bishop 803 et al.* (NSW); Narrabeen, Nov 1912, *Hamilton s.n.* (NSW 612475); Currarong – Beecroft Head, Apr 1936, *Rodway 2182* (NSW); Currarong, Dec 1987, *Clarke s.n.* (NSW 612457).

Distribution and habitat: *Euphorbia psammogeton* occurs along the east coast from Mackay, Qld, south to Currarong, on the south coast of NSW and Lord Howe Island (**Map 45**). It grows on beach sands often on exposed frontal dunes just above the high tide mark.

Phenology: Flowers and fruits have been collected throughout the year.

Notes: *Euphorbia psammogeton* is similar to *E. obliqua* and *E. pallens*. It differs from both species by having the seed surface with faint irregular narrow rounded ridges (versus seed surface smooth for *E. obliqua* and *E. pallens*), and larger gland appendages (0.2–0.4 mm long versus up to 0.1 mm long for *E. obliqua* and *E. pallens*). It also differs from *E. obliqua* by having its cyathia in dichasial cymes (versus cyathia solitary at the nodes for *E. obliqua*).

46. *Euphorbia psilosperma* Halford & W.K.Harris, **species nova** ut videtur maxime arcte cum *E. biconvexa* Domin, *E. coghlanii* F.M.Bailey, *E. trigonosperma* Halford & W.K.Harris cognata sed ab eis capsulis

majoribus, seminibus comparate latoribus et stylis \pm integris. Hae differentiae in tabula 2 breviter repetant. **Typus:** Western Australia. 227 km SW [of] Broome on Great Northern Highway, 11 May 1991, *B.G.Thomson 3630* (holo: NT; iso: DNA).

Monoecious, herbaceous perennial to 20 cm high, many stems arising from woody taproot. **Stems** ascending to erect, much branched, smooth, glabrous (rarely with a few scattered white, spreading hairs c. 0.1 mm long). **Interpetiolar stipules** narrow-triangular, 0.5–0.6 mm long, bipartite, glabrous; margin entire. **Leaves:** petiole 1–2 mm long, smooth, glabrous; blade narrow-oblong or narrow-ovate, 7–20 mm long, 1–5 mm wide, 3.6–10 times longer than wide; adaxial surface green, smooth, mostly glabrous; abaxial surface pale green, smooth, glabrous; base asymmetric with one side cordate, the other obtuse; margin entire; apex acute to obtuse. **Cyathia** solitary at the nodes, occasionally clustered on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles c. 1 mm long, smooth, glabrous. **Involucres** turbinate, 0.7–0.8 mm long, 0.8–0.9 mm across; lobes 5, triangular, c. 0.5 mm long, margin entire or ciliate; glands 4, stipitate, cupuliform, with shallow central pit or longitudinal trough, transverse-elliptic in outline, 0.2–0.3 mm long, 0.4–0.5 mm wide, pale green or pink; gland appendages conspicuous, spreading radially, transverse-elliptic, 0.1–0.4 mm long, 0.4–1.2 mm wide, white, glabrous, margin entire; bracteoles 0.5–0.8 mm long, adnate for c. 1/2 of their length to involucre, free portion divided into few subulate glabrous segments. **Staminate flowers** 5–10 per cyathium; pedicels 0.7–1.2 mm long; staminal filaments 0.2–0.3 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, spreading, smooth, glabrous, each entire or scarcely bifid distally, the apices terete. **Capsules** exserted from involucre on pedicel to 2.5 mm long, transversely broad-elliptic in lateral view, 2–2.2 mm long, 2.8–3 mm across, deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** very broad-ovate in outline, 1.2–1.4 mm long, 0.9–1.2 mm tangentially, 0.9–1.3 mm radially, tetragonous, trigonal or suborbicular in

cross section; dorsal and ventral faces planar or convex, smooth; exotesta thin, of even thickness over surface, grey-white, \pm smooth, becoming mucilaginous when moistened; endotesta red-brown. **Figs 19, 27P.**

Additional selected specimens examined: **Western Australia.** Derby to Broome road, 20.3 km S (by road) of Derby, Apr 1985, *Aplin 77 et al.* (PERTH); 63 miles [c. 101 km] E of Derby on road to Fitzroy Crossing, Mar 1967, *Power 190* (PERTH); just NW of Wolf Creek Crater, Apr 1979, *George 15290* (PERTH); between Port Hedland and Mundabullangana Station, Feb 1962, *George 3339* (PERTH). **Northern Territory.** 2 km S of Daly Waters on Stuart Highway, Feb 1988, *Thomson 2237* (DNA); 28 km S [of] Lajamanu–Tanami, Feb 1988, *Wilson 1003* (DNA); Barkly Tableland, Attack Creek, Stuart Highway, Jul 1974, *Carr 2567 & Beaglehole ACB46346* (MEL, NSW).

Distribution and habitat: *Euphorbia psilosperma* occurs in scattered localities from near Port Hedland, WA, eastward to Daly Waters, NT (**Map 46**). It grows on red sands on aeolian dunes or plains in *Acacia* open shrubland or mixed low woodland communities. It has been noted on specimen labels, *George 3339 & 15290* (PERTH), to be growing in areas “recently burnt”.

Phenology: Flowers and fruits have been collected in February and April.

Notes: *Euphorbia psilosperma* seems most closely related to *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*. It differs from these species by having larger capsules, relatively broader seeds and more or less entire styles. These differences are summarized in **Table 2**.

Etymology: The specific epithet is from Greek *psilo-*, bare, bald, smooth, and *-spermus*, seeded, in reference to the smooth seeds of this species.

47. *Euphorbia schizolepis* F.Muell. ex Boiss., in A.DC., *Prodr.* 15(2): 20 (1862); *Euphorbia schizolepis* F.Muell. ex Boiss. var. *schizolepis*, Benth., *Fl. Austral.* 6: 47 (1873). **Type:** [Northern Territory.] Hooker’s Creek, s.d., *F. Mueller s.n.* (lecto [here designated]: K 186490; isolecto: MEL 61123).

Illustrations: Wheeler (1992: figs 184L, 185L, 186L); Dunlop *et al.* (1995: 218, fig. 72).

Monoecious, herbaceous perennial to 30 cm high, few to many annual stems arising from crown of thick woody taproot. **Stems** decumbent or erect, sparingly to much branched, smooth, with a moderately dense to dense indumentum; hairs white, weakly appressed to ascending or spreading, crispate, to (0.4)2 mm long. **Interpetiolar stipules** subulate, 1–2.1 mm long, entire or bipartite, hairy as for stems; margin entire or laciniate or parted into few filiform segments. **Leaves:** petiole 1–3 mm long, smooth, with indumentum as for stems; blade ovate to broad-ovate, sometimes somewhat falcate, 11–22 mm long, 7–18 mm wide, 1.2–3 times longer than wide; adaxial surface green or glaucous, papillose, with a sparse to moderately dense indumentum; hairs spreading to ascending, crispate, to 0.8 mm long; abaxial surface similar to but paler than adaxial surface; base asymmetric with one side cordate, the other rounded; margin serrulate sometimes only distally; apex obtuse or acute. **Cyathia** solitary at the nodes; peduncles 2–5.5 mm long, smooth, indumentum as for stems. **Involucres** turbinate, 1.7–2.5 mm long, 2.5–3 mm across; lobes 5, triangular, 0.5–1 mm long, margin entire; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong or transverse-elliptic in outline, 0.5–1.1 mm long, 1–2.2 mm wide, pale green; gland appendages conspicuous, spreading radially, obdeltoid or oblong, 0.6–2 mm long, 2–3 mm wide, pink or white, glabrous or moderately densely hairy on abaxial surface and on adaxial surface distally, margin toothed or deeply laciniate; bracteoles 1.6–3 mm long, adnate for 1/3–1/2 of their length to involucre, free portion divided into few \pm linear villose or plumose segments. **Staminate flowers** 30–40 per cyathium; pedicels 2.2–3.8 mm long; staminal filaments 0.7–1(1.5) mm long. **Pistillate flowers:** styles 1.2–2.7 mm long, connate at the base into a column for c. 1/4 of their length, erect to spreading, recurved distally, smooth or papillose abaxially, glabrous or pubescent abaxially, each bifid for 1/3–1/4 of their length or entire, the apices terete. **Capsules** exserted from involucre on pedicel to 7 mm long, transversely broad-

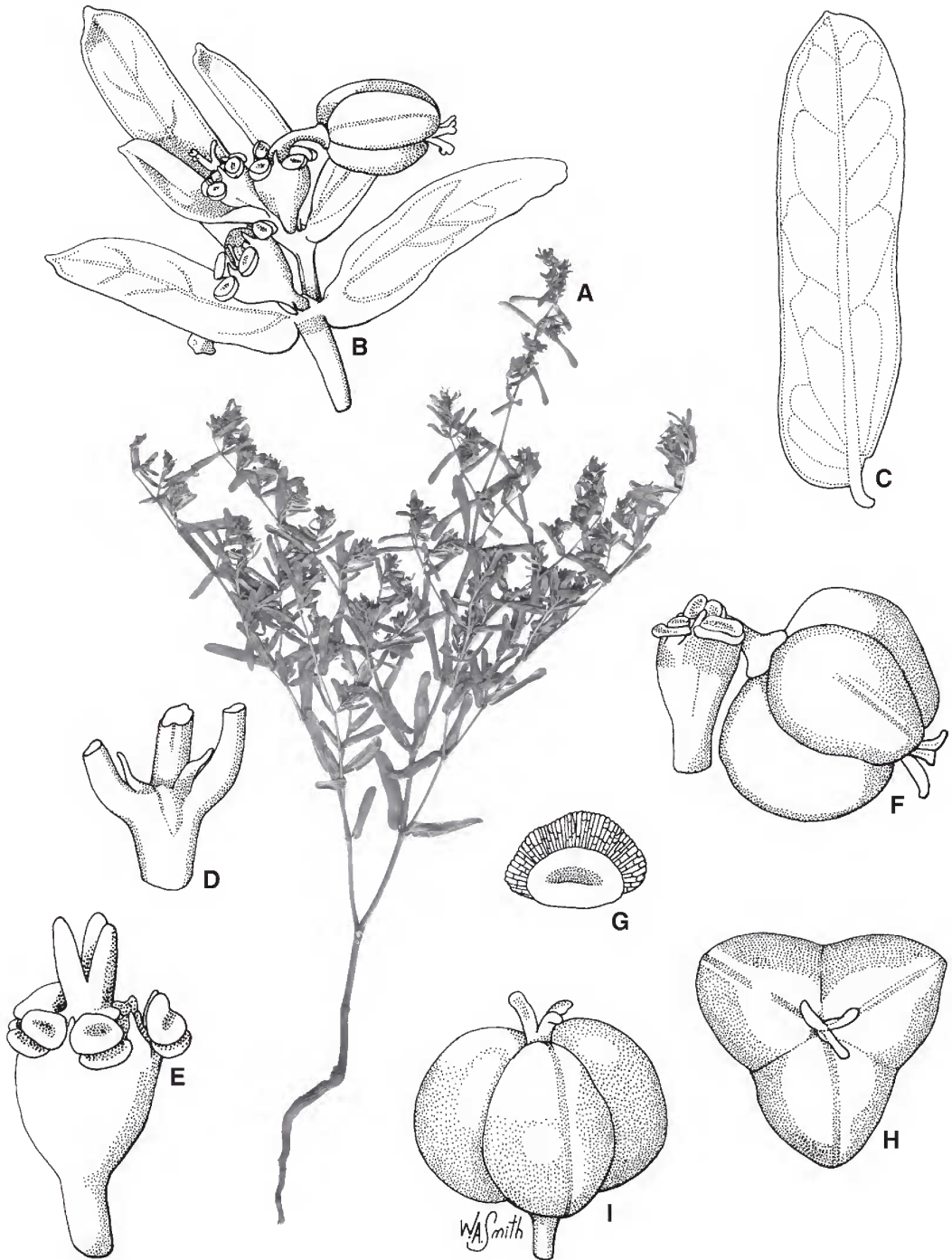


Fig. 19. *Euphorbia psilosperma*. A. habit $\times 0.8$. B. branchlet with cyathia $\times 8$. C. leaf $\times 4$. D. stipule $\times 16$. E. cyathium with female flower $\times 24$. F. capsule with cyathium $\times 12$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 12$. I. capsule, lateral view $\times 12$. A from Thomson 3630 (NT); B from Power 190 (PERTH); C, D, F–I from Thomson 2237 (DNA); E from Wilson 1003 (DNA). Del. W. Smith.

elliptic in lateral view, 3.2–5 mm long; 3.6–5 mm across, shallowly to deeply 3-lobate with keels obtuse, papillose, with a dense indumentum; hairs spreading or appressed-ascending, to 2 mm long; hypogynous disc entire. **Seeds** oblong-ovate in outline, 2.5–3.2 mm long, 1.8–2.3 mm tangentially, 1.6–1.9 mm radially, \pm tetragonous in cross section; dorsal faces convex; ventral faces \pm planar; all faces with 4–6 prominent broad, flat-topped, transverse ridges; exotesta of uneven thickness over surface, distinctly thicker on ridges, pale brown or grey-white, microreticulate, becoming mucilaginous when moistened; endotesta dark brown. **Fig. 27Q.**

Additional selected specimens examined: **Western Australia.** old irrigated Research Station, which is 2 km SW of Kimberley Research Station, Kununurra, Mar 1997, *Mitchell 4528* (BRI, PERTH); Smoke Creek, SW of Lake Argyle, May 1980, *Weston 12186* (PERTH); 2 km N of Lennard Gorge, King Leopold Range, Jun 1992, *Halford Q1448* (BRI, PERTH); Napier Range, Tunnel Creek, Apr 1988, *Dunlop 7753* & *Simon* (BRI); Kelly Bore, c. 25 km E of Ord River homestead, Apr 1977, *Eichler 22385* (PERTH); 6 miles [c. 10 km] NE of Gordon Downs Station, Jul 1949, *Perry 2441* (AD, BRI, DNA, NSW). **Northern Territory.** Annaburroo Station, c. 1 km E of homestead T/O [turnoff], May 2002, *Risler 1788* & *Cusack* (DNA); Old Jim Jim Road, Kakadu N.P., Mar 1987, *Clark 872* (DNA); Arnhem Land, Donydji, Jun 1989, *Dunlop 8514* & *White* (DNA); 7 miles [c. 11 km] W [of] Caledon Bay turnoff, Jun 1972, *Latz 2842* (DNA, NSW); Kakadu Stage 3, road to Gunlom, Apr 1993, *Egan 1937* (DNA); Nitmiluk N.P., NE corner of Park, Apr 2002, *Michell 4056* (DNA); Arnhem Land, near Emu Springs, Sep 1999, *Cowie 8368* & *Harwood* (DNA); 3 miles [c. 5 km] N of Katherine, Mar 1964, *Lazarides 7057* (AD, BRI, DNA); Mataranka, Elsey N.P., Feb 1994, *Egan 3238* & *Cowie* (BRI); Blackfella Creek, Newry Station, Mar 1989, *Russell-Smith 7617* (DNA); Balbarini Creek, 20 miles [c. 32 km] E [of] O.T. Downs, Mar 1959, *Chippendale 5524* (AD, BRI, DNA, NSW); Kalkaringi, Mar 1990, *Thomson 3485* (DNA); near Kalkarindji, Mar 1997, *Michell & Calliss 398* (DNA); 10 km S of Mt Stanford, Jun 1974, *Latz 5361* (BRI); Cattle Creek Station, Aug 1994, *Egan 4282* (DNA).

Distribution and habitat: *Euphorbia schizolepis* is confined to northern Australia from Wyndham, WA, east through north-western NT to Gove; with disjunct occurrences in the Napier and King Leopold Ranges, WA and near Cape Crawford, NT (**Map 47**). It grows in a variety of habitats, including tussock grassland, shrubland or eucalypt woodland communities on dark clay

soils on plains, or in eucalypt forest/woodland or vine thicket communities on sandy to loam soils on ridges, rocky hills and slopes, or alluvial flats.

Phenology: Flowers and fruits have been collected throughout the year, particularly from January to July.

Typification: Boissier (1862) cited two collections in his protologue of *Euphorbia schizolepis* namely “Ad Hooker’s Creek et in sinu Carpentarie Novae Hollandiae sept. (F. Müller!)....(v.s. in h. Kew)”. Two collections, which are considered syntypes of the name *E. schizolepis*, have been located amongst material of *Euphorbia* on loan to BRI from K [**a**: *Euphorbia schizolepis* F.von Mueller, Hookers Creek, DM (K 186490); **b**: *Euphorbia schizolepis* F.von Mueller, Gulf of Carpentaria, DM (K 186491)].

The collection (**a**) from Hookers Creek (K 186490) is here selected as lectotype because it is part of the original material and has morphology that best matches the description in the protologue of this species. There is a collection at MEL [61123] “*Euphorbia schizolepis* F.Mueller, Upper Victoria River” that is a very good match to the material from Hookers Creek (K 186490) and is most likely part of the same collection and is cited here as an isolectotype. The collection (**b**) from the Gulf of Carpentaria (K 186491) is the holotype of Bentham’s *E. schizolepis* var. *glabra*. Duplicates of this collection have been located at G-DC (IDC microfiche 800-73. 2416: I. 4) and MEL [61122]. All are referable to *E. carissoides*.

Notes: *Euphorbia schizolepis* is a distinctive species that seems most closely related to *E. kimberleyensis*. For features distinguishing *E. schizolepis* from *E. kimberleyensis*, refer to the ‘Notes’ section under that species.

The hairs on the stems, leaves and capsules of *E. schizolepis* are typically long (up to 2 mm) and weakly ascending to spreading. The specimens *Forster PIF6007* (Gove Peninsula, 11 km along Dalywoi Bay road [BRI]) and *Wannan 2640* & *Anderson* (Woodcutters Mine, S of Darwin [BRI]) are atypical in having short (c. 0.2 mm long) appressed hairs.

Table 2. Comparison of some morphological characters between *Euphorbia psilosperma*, *E. biconvexa*, *E. coghlanii* and *E. trigonosperma*.

Character	<i>E. psilosperma</i>	<i>E. biconvexa</i>	<i>E. coghlanii</i>	<i>E. trigonosperma</i>
seed shape in outline	very broad-obovate	narrow-obovate or elliptic	oblong to obovate	obovate to very broad-obovate
seed shape in transverse section	tetragonous, trigonal, suborbicular	biconvex	suborbicular	trigonal
seed size (mm)	1.2–1.4 × 0.9–1.2 × 0.9–1.3	1–1.5 × 0.5–0.9 × 0.9–1.1	1.2–1.4 × 0.8–1 × 0.8–1	1.2–1.6 × 0.6–1 × 0.8–1
capsule size (mm)	2–2.2 × 2.8–3	1.6–2 × 2–2.5	1.8–2 × 1.8–2.4	1.5–2.1 × 1.9–2.6
style division	entire or scarcely bifid at the tip	bifid for 1/2 of their length	bifid for 1/3–2/3 of their length	bifid for 1/2–2/3 of their length

The species as circumscribed here varies in the degree of style division. The typical form has styles divided for 1/3–1/4 of their length (e.g. *Lazarides* 7057, *Mitchell* 4528) and is commonly observed in collections from the Kimberley and Victoria River regions in the southern part of the species range. A second form with entire styles (e.g. *Chippendale* 5524, *Perry* 2441) is more commonly recorded in the northern part of the species range from Darwin to Arnhem Land.

48. *Euphorbia schultzii* Benth., *Fl. Austral.* 6: 47–48 (1873); *Chamaesyce schultzii* (Benth.) D.C. Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Northern Territory.] Port Darwin, *s.d.*, [*M. Schultz*] 844 (comm. by Schomburgk, 7 December 1871) (lecto [here designated]: K 186494).

Monoecious, annual or herbaceous perennial with thickened woody taproot, 10–40 cm high, with few to many stems arising from base. **Stems** decumbent to erect or prostrate, sparingly to much branched, smooth, with a moderately dense indumentum (rarely glabrous); hairs appressed to spreading, curved or straight, 0.1–1 mm long, white. **Interpetiolar stipules** subulate to narrow-triangular, 0.4–1.2 mm long, deeply bipartite, glabrous or with indumentum as for stems; margin entire or laciniate with teeth often gland-tipped. **Leaves:** petiole 0.4–1 mm long, smooth, with indumentum as for stems; blade

narrow-oblong to oblong, narrow-ovate to ovate or oblong-obovate to obovate, (3)4–16 mm long, 1.5–9 mm wide, 1.2–2.9 times longer than wide; adaxial surface green often with reddish tinge, smooth or papillose, glabrous or with a sparse to moderately dense indumentum consisting of ascending to spreading, ± straight hairs 0.2–0.8 mm long; abaxial surface pale green, pink, smooth or papillose; glabrous or sparse to moderately dense indumentum consisting of appressed-ascending to spreading, ± straight hairs 0.1–0.8 mm long; base asymmetric with one side cordate to auriculate, the other rounded to cordate; margin serrate to serrulate, often only along one side and distally (rarely entire); apex obtuse to acute or rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles 0.1–1.5 mm long. **Involucres** turbinate to cupuliform, 0.8–0.9 mm long, 0.7–1.4 mm across; lobes 5, triangular, *c.* 0.4 mm long, margin fimbriate or entire; glands 4, stipitate, cupuliform, with distinct tangential trough and thickened rim, transverse-oblong in outline, 0.1–0.3 mm long, 0.4–0.6 mm wide, pink; gland appendages conspicuous, spreading radially, very broad-obovate or transverse-oblong, 0.1–0.6 mm long, 0.4–0.8 mm wide, white to pink, glabrous, margin entire, erose or shallowly lobed; bracteoles 0.5–0.8 mm long, adnate for *c.* 1/5 of their

length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** 4–20(27) per cyathium; pedicels 0.7–1 mm long; staminal filaments 0.1–0.3 mm long. **Pistillate flowers:** styles 0.2–0.6 mm long, spreading, recurved distally, smooth, glabrous or sparsely hairy, entire or bifid for 1/3–2/3 the length, with terete apices. **Capsules** exserted from involucre on pedicel to 3 mm long, depressed ovate or transversely elliptic to broad-elliptic in lateral view, broadest at or below the equator, 1.5–2.2 mm long, 2–3 mm across, deeply 3-lobate with keels acute, papillose (rarely smooth), glabrous or with a sparse to moderately dense indumentum consisting of appressed to spreading hairs to 0.2 mm long; hairs evenly distributed over surface (rarely confined to keels); hypogynous disc lacinate or entire. **Seeds** ovate or broad-ovate in outline, 1–1.5 mm long, 0.6–0.8 mm tangentially, 0.6–0.8 mm radially, tetraquetrous in cross section; dorsal faces convex to planar; ventral faces planar to concave; all faces with 3–5 prominent \pm transverse or irregular, rounded ridges; exotesta thin, of even thickness over surface or of uneven thickness and distinctly thicker on ridges, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta pale to dark brown.

Distribution and habitat: *Euphorbia schultzii* is widespread across northern Australia from the Kimberley, WA through the NT to northern Qld.

Typification: Bentham (1873) in his protologue of *Euphorbia schultzii* cited four collections by M. Schultz from Port Darwin settlement, NT (“N. Australia. Port Darwin, Schultz, n. 15, 237, 844 and 879”). All of these have been located amongst material of *Euphorbia* on loan to BRI from K: *Schultz 15* (K 186495); *Schultz 844* (K 186494); *Schultz 879* (K 186493); *Schultz 237* (K 186492). The collection *Schultz 844* (K 186494) is here chosen as the lectotype of *Euphorbia schultzii* because it has morphology that agrees with the description in the protologue, is the best preserved and most ample of the original material, and has mature capsules and seed attached. The syntypes *Schultz 15* (K 186495); *Schultz 844* (K 186494); *Schultz 879* (K 186493); *Schultz 237* (K 186492) are all referable to *E. schultzii* var. *schultzii* as applied here.

Notes: *Euphorbia schultzii* has been confused with *E. careyi* and *E. australis* in the past. It can be distinguished from both species by the capsules that are distinctly broader than long (1.5–2.2 mm long \times 2–3 mm across) and deeply 3-lobate (versus capsules that are more or less as long as wide (1.4–2 \times 1.5–2.1 mm for *E. australis*; 1.4–1.6 \times 1.6–1.9 mm for *E. careyi*). It also differs from *E. careyi* in having cupuliform involucre glands with a distinct tangential trough and thickened rim rather than patelliform with planar or shallowly concave gland surface.

Two varieties are recognised which can be distinguished using the following key.

Key to varieties of *Euphorbia schultzii*

Capsule hairy	48a. <i>E. schultzii</i> var. <i>schultzii</i>
Capsule glabrous	48b. <i>E. schultzii</i> var. <i>comans</i>

48a. *Euphorbia schultzii* var. *schultzii*

Euphorbia australis var. *glaucescens* Boiss., in A.DC., *Prodr.* 15(2): 36 (1862). **Type:** [Queensland. COOK DISTRICT:] sandy banks of the Gilbert River, *s.d.*, *F. Mueller s.n.* (holo: K 186466; iso: MEL 503406, P 698528 element on the right hand side of sheet).

Illustrations: Wheeler (1992: figs 184M, 185M, 186M); Dunlop *et al.* (1995: 218, fig. 72).

Stems erect or prostrate, with a moderately dense indumentum; hairs appressed or spreading, curved or straight, 0.1–1 mm long. **Leaf blades:** narrow-oblong to oblong, ovate

or oblong-obovate to obovate, (3)4–16 mm long, 1.5–9 mm wide, 1.7–2.9 times longer than wide; adaxial surface glabrous or with a sparse to moderately dense indumentum consisting of ascending to spreading, \pm straight hairs 0.2–0.8 mm long; abaxial surface glabrous or with a sparse indumentum consisting of hairs similar to those on adaxial surface; base asymmetric with one side cordate, the other cuneate to rounded. **Involucres** turbinate to cupuliform, 0.8–0.9 mm long, 0.7–1.4 mm across; gland appendages conspicuous, spreading radially, transverse-oblong, 0.1–0.6 mm long, 0.7–0.8 mm wide, margin entire or irregularly toothed. **Staminate flowers** 10–20 per cyathium. **Pistillate flowers**: styles 0.2–0.6 mm long, glabrous or sparsely hairy, entire or bifid for 1/3–2/3 of their length. **Capsules** depressed ovate or transversely elliptic in lateral view, 1.5–2.2 mm long, 2–3 mm across, with a sparse to moderately dense indumentum consisting of appressed to spreading hairs to 0.2 mm long; hairs evenly distributed over surface (rarely confined to keels); hypogynous disc lacinate or entire. $n = 11$. **Fig. 27R**.

Additional selected specimens examined: **Western Australia.** along the Ord River at Ivanhoe Crossing, Apr 1977, *Eichler 22177* (PERTH); base of Mt Nyulasy, 198 km N of Halls Creek on road to Kununurra, c. 35 km N of Turkey Creek, Apr 1985, *Aplin 1347 et al.* (PERTH); Windjana Gorge N.P., outside drip line immediately in front of Carpenters Gap rockshelter, July 1997, *Wallis LW97A/37* (PERTH); along Millie Windie Road (from Lennard River crossing), Jun 1988, *Wilson 12952* (PERTH); Ord River between Springvale and Bedford, Apr 1972, *Aplin 4851* (PERTH); 39 km S of Forrest River on Duncan Highway, Apr 1977, *George 14452* (PERTH); Geike Range, near Geike Gorge, Apr 1988, *Simon 3986 & Cranfield* (BRI). **Northern Territory.** Meckitt Creek, 2 km S [of] boat ramp, Dec 1986, *Wightman 3301* (DNA); Cape Hotham, Escape Cliff, Mar 1993, *Cowie 3315* (DNA); 11.2 miles [c. 18 km] S [of] Batchelor, Mar 1961, *Chippendale 7739* (BRI, DNA, MEL, NSW); Fitzmaurice River, Feb 1994, *Leach 4071* (BRI, MEL); Binjari Settlement, 15 km W of Katherine, Mar 1996, *Barritt 2094* (DNA); Gregory N.P., past Matt Wilson Lookout, Feb 1992, *Cowie 2239 & Brocklehurst* (DNA, MEL). **Queensland.** **COOK DISTRICT:** Royal Arch Cave section, Chillagoe – Mungana Caves N.P., Jan 2005, *McDonald KRM3542 & Little* (BRI); Newcastle Range between Georgetown and Mt Surprise, Jan 2005, *McDonald KRM3499* (BRI); Mt Eliza, 8 km NW of Mount Surprise, Jan 1993, *Bean 5498 & Forster* (BRI). **BURKE DISTRICT:** E of the Burke Development Road at the Bang Bang Jumpup, Feb 2006, *Fox IDF3829 & Willson* (BRI). **NORTH KENNEDY DISTRICT:** ‘Maidavale’, E

of Mingela, Apr 1991, *Bean 2952* (BRI); c. 67 km S of Charters Towers near Mt Malakoff, Jun 1998, *Thompson CHA451 & Turpin* (BRI).

Distribution and habitat: *Euphorbia schultzei* var. *schultzei* occurs across northern Australia from the Kimberley region, WA, through the northern area of the NT to near Townsville, north Qld (**Map 48a**). It grows in eucalypt/*Acacia* woodland or eucalypt open forest communities on rocky hills, plateaux or riverine flats, rarely in *Spinifex* grassland on coastal dunes or rocky foreshores. The soils are mostly sandy to loam derived from a range of substrates.

Phenology: Flowers and fruits have been collected throughout the year, particularly from January to June.

Notes: As accepted here, there is some variation in the indumentum form and distribution, and style division of *Euphorbia schultzei* var. *schultzei*. Generally, specimens fall into those with curved, appressed to ascending hairs 0.1–0.3 mm long and those with \pm straight, spreading hairs 0.2–1 mm long. Both forms occur throughout the variety’s distributional range.

Euphorbia schultzei var. *schultzei* typically has styles divided for 1/3–2/3 of their length. A number of specimens with entire styles (e.g. *Bean 2952*, *McDonald KRM3499*) have been collected from the eastern end (Mt Isa to the Townsville region, Qld) of the varieties range.

The indumentum on the capsules of this variety is typically evenly distributed over the capsule surface. Specimens *Eichler 22177* (from WA) and *Fox IDF3829* (from Qld) are atypical in having the hairs on capsules restricted to their keels.

Collections from the Kimberley, WA generally have narrower ridges on the seed surface and generally shorter (<0.2 mm long) spreading hairs on the stems leaves and capsules (e.g. *Wilson 12952*, *Aplin 4851*, *Aplin 1347 et al.*). Further investigations of these forms are warranted.

48b. *Euphorbia schultzii* var. *comans* (W.Fitzg.) Halford & W.K.Harris **combinatio et status nova**; *Euphorbia comans* W.Fitzg., *J & Proc. Roy. Soc. Western Australia* 3: 161 (1918). **Type:** Western Australia. Derby, April 1905, *W.V.Fitzgerald* 193 (lecto [here designated]: PERTH 2847221; isolecto: NSW 98808).

Illustration: Wheeler (1992: figs 184D, 185D, 186D), as *Euphorbia comans*.

Stems decumbent to erect (rarely prostrate), with a moderately dense indumentum (rarely glabrous); hairs spreading, \pm straight, 0.2–0.9 mm long. **Leaf blades:** narrow-oblong to oblong, narrow-ovate to ovate, 6–15 mm long, 2–9 mm wide, 1.2–2.5 times longer than wide; adaxial surface glabrous or with a sparse indumentum consisting of spreading, \pm straight hairs 0.5–0.6 mm long; abaxial surface glabrous or with a sparse to moderately dense indumentum consisting of spreading, \pm straight hairs 0.5–0.8 mm long; base asymmetric with one side cordate to auriculate, the other rounded to cordate. **Involucres** turbinate, c. 0.7 mm long, 0.7–1.4 mm across; gland appendages conspicuous, spreading radially, very broad-obovate or transverse-oblong, 0.1–0.4 mm long, 0.4–0.6 mm wide, margin entire, erose or shallowly lobed. **Staminate flowers** 4–20(27) per cyathium. **Pistillate flowers:** styles 0.2–0.4 mm long, glabrous, bifid for 1/3–2/3 the length. **Capsules** depressed ovate or transversely elliptic to broad-elliptic in lateral view, 1.5–1.8 mm long, 2–2.7 mm across, glabrous; hypogynous disc entire. **Fig. 28A.**

Additional selected specimens examined: **Western Australia.** 11 miles [c. 18 km] S of Derby, Jan 1971, *Allan* 565 (PERTH); Mangel Creek Station S of the Broome to Derby Road, Apr 1968, *Payne* D (PERTH). **Northern Territory.** Victoria Highway, 57 km W of Katherine, Dec 1994, *Barritt* 1693 (DNA, MEL); Nitmiluk N.P., Mar 2001, *Michell* 3211 (DNA); Cutta Cutta Reserve, Jan 1993, *Egan* 831 (DNA); 43.3 miles [c. 70 km] SE [of] Top Springs Store, Apr 1959, *Chippendale* 5795 (DNA, MEL); 6 km N of Dunmarra, Jan 1994, *Egan* 3025 (DNA); Foelsche River, Jan 1989, *Thomson* 2956 (DNA); 30 miles [c. 48 km] SSW of Wavehill Station, Jun 1949, *Perry* 2220 (BRI, DNA); Birrindudu Range, NW Tanami Desert, May 2004, *Latz* 19970 & *Brennan* (NT); 50 km W [of] Newcastle Waters homestead, Feb 1989, *Thomson* 3188 (DNA); 20 km NE [of] Elliott, Feb 1989, *Thomson* 3218 (DNA); 3 miles [c. 4.8 km] NE [of]

Newcastle Waters, Mar 1959, *Chippendale* 5431 (BRI, DNA, MEL); 50 km N of Renner Springs on the Stuart Highway, Feb 1988, *Thomson* 2238 (DNA); Mittlebah Station, Mitchiebo Waterhole, Mar 1981, *Henshall* 3481 (AD, BRI); 46 km N of Three Ways on Stuart Highway, Feb 1988, *Thomson* 2242 (DNA). **Queensland.** BURKE DISTRICT: 28.2 km S by road from Musselbrook Mining Camp on road to Camooweal, Apr 1995, *Thomas & Johnson* MRS435 (BRI); 1 km N of Dugald River crossing on Julia Creek – Normanton Road, Mar 1977, *Farrell* TF782 (BRI); 28.4 km by road from junction of Burke and Gulf Development Roads, towards Flinders River, Jan 2005, *McDonald* KRM3447 (BRI).

Distribution and habitat: *Euphorbia schultzii* var. *comans* occurs from Derby, WA, across the north of the NT to Cloncurry, north-western Qld (**Map 48b**). It grows in eucalypt open woodland or *Acacia/Grevillea* shrubland communities on sandy soils, on alluvial flats, sand plains, sandstone plateaux or rocky rhyolite, granite or laterite hills. Also found in vine thicket on basalt soils.

Phenology: Flowers and fruits have been collected from December to June (mostly from January to April).

Typification: Fitzgerald (1918) based his description of *Euphorbia comans* on material collected by him from near Derby, Denham and King Rivers, Kimberley, WA. All of these have been located amongst material of *Euphorbia* on loan to BRI from PERTH and NSW: Derby, Apr 1905, *W.V.Fitzgerald* 193 (PERTH 2847221, NSW 98808); Denham River, Oct 1906, *W.V.Fitzgerald* s.n. (NSW 612560); King River, Oct 1906, *W.V.Fitzgerald* s.n. (NSW 612552). The collection *Fitzgerald* 193 (PERTH 2847221) is here chosen as the lectotype of *E. comans* because it has morphology that agrees with the description in the protologue, and is the best preserved and most ample of the original material. All the syntypes seen are referable to *E. schultzii* var. *comans* as applied here.

Notes: We have reduced *Euphorbia comans* to a synonym of *E. schultzii* and recognised the taxon at the varietal level. It differs from *E. schultzii* var. *schultzii* in having glabrous capsules.

Most of the specimens of this variety seen by us have typically spreading hairs on the stems. A rare form with glabrous stems is

represented by *Strong* 975, 976 (Sailor Creek, Rosewood Station, May 1987 [DNA]) and *Russell-Smith* 7614 & *Lucas* (Blackfellow creek, Newry Station, Mar 1989 [BRI, NT]).

49. **Euphorbia serpens* Kunth, in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* 2: 52 (1817); *Chamaesyce serpens* (Kunth) Small, *Fl. S.E. U.S. [Small]* 709 (1903). **Type:** Venezuela. "Cumana prope Bordones et Punta Araya", *F.W.H.A. von Humboldt & A. Bonpland* 407 (holo: P-Bonpl. n.v. [IDC microfiche 6209-1.32: II. 4]).

Illustration: Lin *et al.* (1991: 246, fig. 9), as *Chamaesyce serpens*.

Monoecious, annual or herbaceous perennial with slender taproot, many stems arising from rootstock, the whole plant glabrous. **Stems** prostrate, much branched, smooth, rooting at nodes. **Interpetiolar stipules** broad-triangular, 0.5–0.6 mm long, glabrous; margin lacerate distally. **Leaves:** petiole 0.3–0.6 mm long, smooth; blade broad-oblong, broad-elliptic or rotund, 2.5–4 mm long, 2.5–3.7 mm wide, 1–1.2 times longer than wide; adaxial and abaxial surfaces green, smooth; base \pm symmetric, cordate; margin entire; apex retuse. **Cyathia** solitary at the nodes; peduncles 0.5–2 mm long, smooth, glabrous. **Involucres** turbinate, 0.5–0.6 mm long, 0.7–0.8 mm across; lobes 5, triangular, 0.3–0.4 mm long, margin fimbriate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong in outline, *c.* 0.15 mm long, 0.15–0.3 mm wide, purple; gland appendages conspicuous, spreading radially, transverse-oblong or obdeltoid, 0.1–0.2 mm long, 0.3–0.6 mm wide, white, glabrous, margin entire or shallowly lobed; bracteoles 0.8–1 mm long, adnate for *c.* 1/5 of their length to involucre, free portion divided into few \pm linear hirsute segments. **Staminate flowers** 5–8 per cyathium; pedicels *c.* 1 mm long; staminal filaments *c.* 0.1 mm long. **Pistillate flowers:** styles *c.* 0.4 mm long, spreading, smooth, glabrous, each bifid for *c.* 1/4–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 1.5 mm long, broad-elliptic in lateral view, 1.2–1.4 mm long, 1.4–1.5 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous

disc lacinate. **Seeds** broad-ovate in outline, 0.8–0.9 mm long, 0.6–0.7 mm tangentially, 0.6–0.7 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces planar or concave; all faces with 2–4 faint narrow rounded, transverse ridges; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown. **Fig. 28B.**

Additional selected specimens examined: **South Australia.** Hundred of Wiltunga, section 302, May 1967, *Coley* 1316 (AD). **Queensland.** BURKE DISTRICT: Resolution Street, Hughenden, Sep 2009, *Halford* Q9699 (BRI). NORTH KENNEDY DISTRICT: Dotterel Close, Douglas, Townsville, Sep 2006, *Hooker* NH693 (BRI); Racecourse Road, Ross River South Bank, Townsville, Jan 2005, *Cumming* RJC23142 (BRI). MARANO DISTRICT: McDowall Street, Roma, Feb 2004, *Halford* Q8135 & *Harris* (BRI). DARLING DOWNS DISTRICT: Jimbour, railway line 1 km NW of township, Jan 2001, *Forster* PIF26562 & *Harris* (BRI, MEL). MORETON DISTRICT: Tinchi Tamba Wetland Reserve, Brisbane, Dec 2009, *Halford* Q99745 (BRI). **New South Wales.** 10 km W of Balranald, Dec 1987, *Thomson* 2300 (NSW [mixed collection with *E. dallachyana*], NT).

Distribution and habitat: *Euphorbia serpens* is native of the Americas and is naturalised in Asia, Africa and Australia. In Australia, at present it occurs in scattered localities; in Qld from Townsville, Hughenden, Roma, Jimbour and the Brisbane area, in western NSW near Balranald; and on northern Yorke Peninsula, SA (**Map 49**). It grows in disturbed sites, including roadsides, railway easements, footpaths, urban parklands, garden beds and lawns.

Phenology: Flowers and fruits have been collected in January, February, May, August and December.

Notes: *Euphorbia serpens* is somewhat similar to and easily confused with the native *E. dallachyana*. It differs by having stems rooting at the nodes and generally smaller leaves, capsules and seeds.

The collection, *Copley* 1316 (AD) (from a home garden, Yorke Peninsula, SA) is placed here; however, it is atypical when compared with the rest of the material of *E. serpens* in Australia in having somewhat longer stipules that are bipartite.

50. *Euphorbia sharkoensis* Baill., *Adansonia* 6: 287 (1866). **Type:** [Western Australia.] Sharks Bay, Useless Harbour, in 1863, *Maitl. Brown s.n.* (holo: P 698526 *n.v.* [image seen]; iso: MEL 503410).

Euphorbia drummondii var. *rubescens* Benth., *Fl. Austral.* 6: 49 (1873). **Type:** [Western Australia.] Dirk Hartog's Island, January 1822, *A. Cunningham* 223 (holo: K 186499).

Monoecious, annual or herbaceous perennial to 30 cm high, few to many stems arising from slender taproot, the whole plant glabrous. **Stems** prostrate or erect, sparingly to much branched, smooth, sometimes longitudinally ridged. **Interpetiolar stipules** subulate, 0.1–0.9 mm long, bipartite, glabrous; margin entire or lacinate. **Leaves:** petiole 0.5–1.5 mm long, smooth; blade oblong, elliptic or obovate to oblong-obovate, 3.1–14 mm long, 2.2–7 mm wide, 1.4–2.8 times longer than wide; adaxial and abaxial surface blue-green or green sometimes with reddish tinge along margin, smooth, glabrous; base asymmetric with one side cordate, the other cuneate or rounded; margin entire or serrulate to serrate; apex rounded to obtuse. **Cyathia** solitary at the nodes; peduncles 0.3–1 mm long, smooth, glabrous. **Involucres** campanulate or turbinate, 0.5–0.9 mm long, 0.8–1.2 mm across; lobes 5, triangular, 0.2–0.5 mm long, margin fimbriate or lacinate; glands 4, stipitate, patelliform, planar or shallowly concave with tangential trough, transverse-oblong in outline, 0.2–0.3 mm long, 0.4–0.6 mm wide, red; gland appendages conspicuous, spreading radially, transverse-oblong, 0.1–0.3 mm long, 0.4–0.7 mm wide, red or white, glabrous, margin toothed or deeply lobed; bracteoles 0.4–1 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into few subulate glabrous or hirsute segments. **Staminate flowers** 3–8 per cyathium; pedicels 0.4–1.2 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, spreading or ascending, smooth and glabrous, each bifid for 1/3–1/4 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3 mm long, very broad-ovate or broad-elliptic in lateral view,

1.5–2 mm long, 1.5–2.3 mm across, shallowly 3-lobate with keels acute or obtuse, smooth, glabrous; hypogynous disc entire (rarely lacinate). **Seeds** ovate in outline, (0.9)–1.5 mm long, 0.7–0.8 mm tangentially, 0.6–0.8 mm radially, tetraquetrous in cross section; dorsal faces planar; ventral faces concave; all faces with faint rounded, irregularly ridges; exotesta thin, of even thickness over surface, or sometimes slightly thicker on ridges, white, microreticulate, becoming mucilaginous when moistened; endotesta red brown. *n* = 11.

Additional selected specimens examined: **Western Australia.** Airlie Island, July 1987, *Long VL158* (PERTH); Burgundy Bay (Bomb site area), Alpha Island, Montebello Islands, Oct 2000, *Kenneally 11610* (PERTH); Varanus Island, Lowendale Group, May 1991, *Thomson 3496* (DNA, PERTH); Barrow Island, Oct 1980, *Buckley 6956* (PERTH); Barrow Island, Oct 1980, *Buckley 7159* (PERTH); Legendre Island, May 1991, *Thomson 3506* (PERTH); Legendre Island, Dampier Archipelago, Jun 1962, *Royce 7322* (PERTH); 3.5 miles [c. 5.6 km] S of Exmouth township, May 1965, *George 6591* (PERTH); Ward Reef track on Thevenard Island, May 1990, *White MRW041* (PERTH); 10.5 km S of Exmouth P.O., on track to beach, 0.5 km E of highway, Jul 1977, *McFarland & McFarland 4* (BRI, PERTH); c. 30 km S of Exmouth, along W side of highway, Jul 1977, *McFarland & McFarland s.n.* (PERTH 3995879); near Norcape Lodge, Exmouth, Jul 1977, *McFarland & McFarland s.n.* (BRI [AQ234287]); top of Beagle Hill, Pt [Point] Quobba, c. 50 km NNW of Carnarvon, Sep 1987, *Wilson 12623* (PERTH); 25 miles [c. 40 km] N of Carnarvon on Quobba Road, Sep 1970, *George 10139* (BRI, PERTH); Dorre Island, Aug 1977, *Weston 10547* (PERTH); S of Eagle Bluff, Peron Peninsula, Shark Bay, c. 3.5 km SSE of intersection of Eagle Bluff Road and Denham – Hamelin Road, Oct 1997, *Markey 1625* (PERTH); Taillefer Isthmus, Shark Bay, c. 6 km NNW of repeater station site near Goulet Bluff, Oct 1997, *Markey 1797* (PERTH); c. 10 km N of Bibby Giddy Outcamp on Heirisson Prong, 30 m SSE of Clough's Bar track at c. 2.4 km along track from junction with Useless Loop Road, Sep 1997, *Markey 1733* (PERTH); 10 miles [c. 16 km] S of Overlander (near Hamelin Pool), Aug 1973, *Hassall 73103* (BRI); Port Gregory rubbish tip, 2.5 km SE of town, July 1997, *Davis 3612* (PERTH).

Distribution and habitat: *Euphorbia sharkoensis* is confined to the islands and coastal areas of north western WA, from Roeburne to Shark Bay, with a disjunct occurrence near Port Gregory (**Map 50**). It grows in open shrubland or heathland communities on sandy soils on rocky limestone foreshores or coastal sand dunes.

Phenology: Flowers and fruits have been collected from May to October.

Notes: *Euphorbia sharkoensis* seems most closely related to *E. myrtooides*. It can be distinguished from that species by its generally smaller habit, smaller involucre glands, seeds and capsules, longitudinally ribbed stems, faintly irregularly ridged seed surface and fewer staminate flowers per cyathium.

Euphorbia sharkoensis has often been previously identified as *E. drummondii*. It differs from that species by having involucre glands with a planar or shallowly concave gland surface, gland appendages 0.1–0.3 mm long, with a toothed or deeply lobed margin and seeds with a faintly irregularly ridged surface.

Plants from Barrow Island, Montebello Islands and from islands of the Dampier Archipelago (e.g. *Thomson 3496*, *Buckley 7159*, *Kenneally 11610*) differ from the typical form by having a more woody habit, stems that are more prominently longitudinally ridged, and leaves that are generally thicker and smaller.

The two collections (4–5 miles [6–8 km] N of Yardie Creek, May 1965, *George 6652* [PERTH]; Onslow, Sep 2006, *Halford Q9293* [BRI]) are tentatively placed here. They both differ from the typical form in having gland appendages that are not as toothed or lobed, and more prominent seed sculpturing. These variants warrant further collecting and investigation.

51. *Euphorbia thelephora* Halford & W.K.Harris, **species nova** saepe cum *E. inappendiculata* Domin confusa sed stylis integris (ad vicem stylis 1/2–2/3 longitudinis plerumque capsulis longioribus), 1.5–2 mm longis (ad vicem capsulis 1.3–1.6 mm longis), distincte papillosis (ad vicem capsulis tantum aliquando minute papillosis), seminibus plerumque longioribus 1.3–1.7 mm longis (ad vicem seminibus 0.9–1.3 mm longis) differt. **Typus:** Queensland. BURKE DISTRICT: 83 km S of Normanton on road to Cloncurry, 1 August 2011, *D. Halford QM515* (holo: BRI; iso: AD,

DNA, MEL, MICH, NSW, P, *distribuendi*).

Monoecious or dioecious, herbaceous perennial to 30 cm high, few to many annual stems arising from woody rootstock. **Stems** prostrate, decumbent or erect, sparingly to much branched, smooth or papillose, with a sparse to dense indumentum (rarely glabrous); hairs spreading, \pm straight, 0.1–1.5 mm long, white. **Interpetiolar stipules** subulate, 0.3–1.3 mm long, bipartite, papillose, glabrous or hairy as for stems; margin entire or laciniate. **Leaves:** petiole 0.3–1 mm long, papillose (rarely smooth), indumentum as for stems; blade oblong, obovate, elliptic or oblong-elliptic to rotund, 2–8 mm long, 1–6 mm wide, 1–2.4 times longer than wide; adaxial surface green, grey-green, sometimes with reddish tinge along margin, smooth or papillose, glabrous or with a sparse to dense indumentum consisting of spreading, straight to curved hairs 0.1–0.8 mm long; abaxial surface green or pale, papillose; glabrous or with an indumentum as for adaxial surface; base asymmetric with one side cordate, the other rounded to obtuse; margin entire or obscurely toothed distally; apex rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles 0.2–0.5 mm long, papillose, indumentum as for stems. **Involucres** cupuliform or turbinate, 0.7–1.4 mm long, 0.7–1.4 mm across; lobes 5, triangular, 0.3–0.6 mm long, margin entire or ciliate; glands 4, stipitate, patelliform, planar to shallowly concave, or cupuliform with distinct tangential trough and thickened rim, transverse-oblong, orbicular or reniform in outline, 0.1–0.3 mm long; 0.2–0.5(0.9) mm wide, red or yellow; gland appendages conspicuous to inconspicuous or absent, spreading radially, transverse-oblong or triangular, 0.05–0.4 mm long, 0.05–1.1 mm wide, white or red, glabrous, margin entire or lobed; bracteoles 0.6–1 mm long, adnate for *c.* 1/5 of their length to involucre, free portion divided into few to many subulate, glabrous or hirsute segments. **Staminate**

flowers 1–13 per cyathium; pedicels 0.6–1.2 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles (0.2)0.3–1.1 mm long, spreading, recurved distally, smooth or papillose abaxially, glabrous or sparsely hairy proximally, entire, the apices terete. **Capsules** exserted from involucre on pedicel to 2.3 mm long, elliptic to broad-elliptic in lateral view, 1.5–2.2 mm long, 1.2–1.8 mm across, shallowly 3-lobate with keels acute to obtuse, papillose rarely smooth, glabrous or with a sparse to dense indumentum consisting of spreading hairs to 0.5 mm long; hypogynous disc entire. **Seeds** narrow-ovate or ovate, 1.2–1.7 mm long, 0.5–0.8 mm tangentially, 0.5–0.7 mm radially, tetraquetrous in cross section; dorsal faces \pm planar, smooth or with numerous, prominent, narrow rounded \pm transverse ridges or with a single medial longitudinal ridge; ventral faces planar to concave, smooth or with numerous, prominent, narrow rounded \pm transverse ridges; exotesta thin, of even thickness over surface or of uneven thickness and distinctly thicker on ridges, grey-white, pale brown, microreticulate, becoming mucilaginous when moistened; endotesta brown to red-brown.

Key to varieties of *Euphorbia thelephora*

- 1 Seeds with transverse ridges **51c. *E. thelephora* var. *rugosa***
1. Seeds smooth or finely granulate **2**
- 2 Leaves and capsules glabrous or with a few scattered hairs **51a. *E. thelephora* var. *thelephora***
2. Leaves and capsules sparsely to densely hairy **51b. *E. thelephora* var. *australis***

51a. *Euphorbia thelephora* var. *thelephora*

Euphorbia sp. Beddome Range (D.E. Albrecht 5656); Short *et al.* (2011: 31).

Stem glabrous or with a sparse indumentum of spreading hairs to 0.5(1) mm long. **Leaves** with adaxial and abaxial surfaces glabrous or rarely with a few scattered spreading hairs to 0.3 mm long. **Involucres** turbinat, 0.7–0.8 mm long, 0.7–0.9 mm across; glands patelliform, planar or shallowly concave, transverse-oblong or orbicular in outline, 0.1–0.3 mm long, 0.2–0.5 mm wide, yellow;

Distribution and habitat: *Euphorbia thelephora* occurs from the Barkly Tableland, NT, eastward to Normanton, Qld and south to Coober Pedy, SA and east to Tibooburra in far north-western NSW.

Notes: *Euphorbia thelephora* has been confused with *E. inappendiculata*. It differs from that species by having styles entire (versus styles bifid for 1/2–2/3 of their length), generally longer capsules (1.5–2 mm long versus capsules 1.3–1.6 mm long for *E. inappendiculata*) which are distinctly papillose (versus capsules only occasionally minutely papillose for *E. inappendiculata*), and generally longer seeds (1.3–1.7 mm long versus 0.9–1.3 mm long for *E. inappendiculata*).

Etymology: The specific epithet is from Greek *thelephorus*, bearing nipple-like projections, in reference to the papillate surface on the capsules and leaves in the typical form of this species.

Notes: *Euphorbia thelephora* varies in attributes of its indumentum and seeds. On this basis, three varieties are formally recognised here and can be distinguished using the following key.

gland appendages inconspicuous or absent, to 0.2 mm long, 0.05–0.2 mm wide, white. **Staminate flowers** 1–4 per cyathium. **Capsules** elliptic in lateral view, papillose, glabrous or rarely with a few scattered spreading hairs to 0.3 mm long. Seeds narrow-ovate, dorsal and ventral faces smooth. $n = 11$. **Figs 20, 28C.**

Additional selected specimens examined: **Northern Territory.** 2 miles [c. 3.2 km] W [of] Avon Downs, Jun 1960, *Chippendale* 7262 (AD, BRI, DNA, MEL); 10 km N of Brunette Downs turnoff on Borroloola Road, Sep 1978, *Farrell* TF901 (BRI); c. 12 miles [c. 19 km] W of Camooweal, Jul 1974, *Hassall* 7448 (BRI); James River

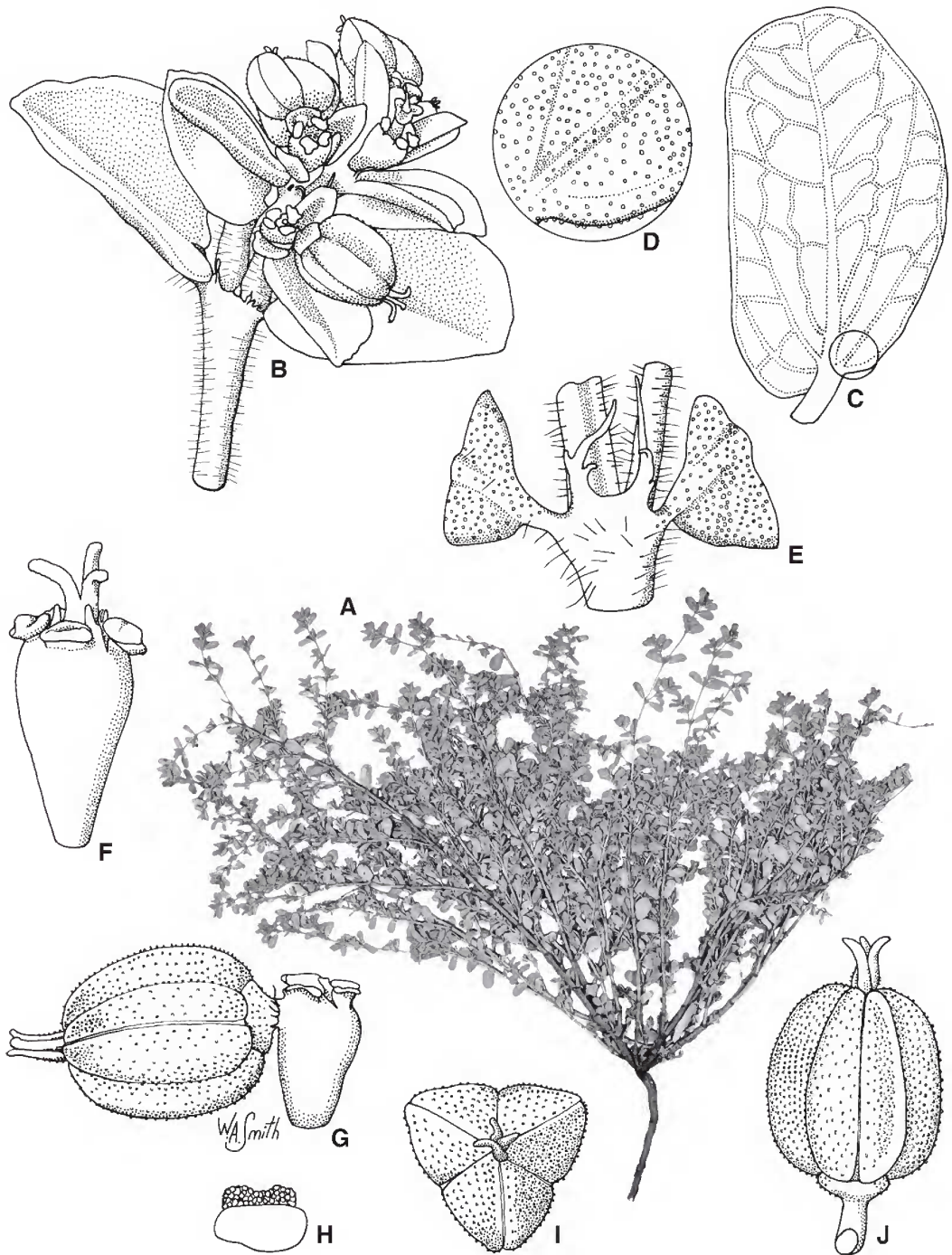


Fig. 20. *Euphorbia thelephora* var. *thelephora*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. papillae on lower leaf surface $\times 32$. E. stipules $\times 16$. F. cyathium with female flower $\times 24$. G. capsule with cyathia $\times 16$. H. cyathial gland with appendage, adaxial view $\times 32$. I. capsule, top view $\times 16$. J. capsule, lateral view $\times 16$. A, C–E from Chippendale 7262 (BRI); B, F–J from Halford Q8602 & Thomas (BRI). Del. W.Smith.

at crossing, Barkley Highway, Avon Downs, Jun 1968, *Nicholls 860* (NT); Beddome Range, New Crown Station, Nov 1993, *Albrecht 5656* (BRI, DNA, NT); Beddome Range, May 1974, *Latz 5232* (BRI). **Queensland.** BURKE DISTRICT: 8 km S of Normanton, May 1976, *Hassall 7634* (BRI); 16 km SE of Leichhardt Falls on the Burketown – Donors Hill Road, Apr 1974, *Pullen 8939* (BRI); c. 20 km W [of] Undilla, Burketown – Camooweal Road, May 1990, *Latz 11640* (DNA); Hughenden – Mt Isa Road, c. 99 km W of Julia Creek, Apr 1975, *Halliday 421* (BRI); ‘Somerville’, 50 miles [c. 80 km] NE of Maxwelton, May 1963, *Entwistle 3* (BRI). GREGORY NORTH DISTRICT: 33 km N of Boulia, May 1976, *Hassall 7646* (BRI); 130 km W of Winton on road to Boulia, Sep 2005, *Halford Q8602 & Thomas* (BRI); 5 km WNW of ‘Red Hill’, Jun 1978, *Purdie 1228* (BRI); 27 km WNW of ‘Marion Downs’, Sep 1978, *Purdie 1436* (BRI); 124 km ESE of Bedourie, May 1976, *Hassall 7656* (BRI); Diamantina N.P., N boundary of park, Apr 1997, *Forster PIF20755 & Holland* (BRI). GREGORY SOUTH DISTRICT: 18 miles [c. 29 km] NE of Betoota, May 1975, *Hassall 7519* (AD, BRI); 70 km NW of Monkira homestead, May 1985, *Neldner 1870 & Stanley* (BRI). **South Australia.** Pandie Pandie Station, gibber plain 3.5 km S of Lake Moorayeye, June 1983, *Alexander 2277* (AD); Pedirka, Aug 1932, *Ising 3012* (AD); 5 km S of Copper Hill Station homestead, Aug 1992, *Badman 5972* (AD).

Distribution and habitat: *Euphorbia thelephora* var. *thelephora* occurs from the Barkly Tableland, NT, eastward to Normanton, Qld, and south to Coober Pedy, SA and into north-western NSW (**Map 51a**). It commonly grows in *Dichanthium/Astrebla* grassland, *Atalaya* and *Grevillea* woodland or *Acacia cambagei* R.T.Baker tall shrubland, on stony clay or cracking clay soils on undulating plains. The variety also inhabits *Eucalyptus camaldulensis* Dehnh. low open woodland along drainage lines, open grassland and woodland on the slopes of small mesas or low stony hills.

51b. *Euphorbia thelephora* var. *australis* Halford & W.K.Harris, **varietas nova** ab *E. thelephora* var. *thelephora* indumento caulium foliorumque pilis sparsis usque densis (ad vicem glabris vel pilis paucis dispersis), floribus staminibus 5–13 in quoque cyathio (ad vicem floribus staminibus 1–4 in quoque cyathio) necnon ab *E. thelephora* var. *rugosa* seminis superficie laevi (ad vicem superficie porcis ± transversis multis prominentibus angustis rotundatis praedito) differt. **Typus:** Queensland. GREGORY NORTH DISTRICT: c. 20 km E along Donahue Highway from Qld/NT border, W of Boulia, 15 October

2011, *D. Halford QM604* (holo: BRI, iso: AD, DNA, MICH, NSW, *distribuendi*).

Stem with a sparse to dense indumentum of spreading hairs to 0.8 mm long. **Leaves:** adaxial and abaxial surfaces with a sparse to dense indumentum of spreading hairs to 0.8 mm long. **Involucres** turbinate, cupuliform, 0.8–1.4 mm long, 1–1.4 mm across; glands patelliform, planar to shallowly concave or rarely cupuliform with distinct tangential trough, transverse-oblong or reniform in outline, 0.1–0.3 mm long; 0.3–0.5(0.9) mm wide, red or yellow; gland appendages conspicuous or absent, transverse-oblong, 0.1–0.4 mm long, 0.4–0.5(1.1) mm wide, white or red. **Staminate flowers** 5–13 per cyathium. **Capsules** elliptic to broad-elliptic in lateral view, papillose (rarely smooth), densely hairy with weakly spreading hairs 0.3–0.5 mm long. Seeds narrow-ovate to ovate, dorsal and ventral faces smooth. **Fig. 28D.**

Additional selected specimens examined: **Northern Territory.** Horseshoe Bend Road, 5 km N of Lilla Creek, Aug 1988, *Barritt 776* (DNA [mixed collection with *E. thelephora* var. *rugosa*]). **Queensland.** BURKE DISTRICT: Silver Hills, 15 km N of Richmond, Apr 1977, *Farrell TF807* (BRI). GREGORY NORTH DISTRICT: Roxborough Downs, Jan 1896, *Bailey s.n.* (BRI [AQ202490]) [mixed collection with *E. thelephora* var. *rugosa*]. **South Australia.** 14 km E of Roxby Downs homestead, Apr 1989, *Badman 2032* (AD); 8 km SE of Netting Dam, Arm of Lake Torrens, Andamooka Station, Jul 1989, *Badman 3247* (AD); 1 km S of homestead, Muloorina Station, Apr 1996, *Badman 8903* (AD); c. 8 km NE of Koonamore, Curnamona Road, Apr 1968, *Barker 351* (AD); Borefield Road, Apr 1997, *Bates 46870* (AD); Waukaringa Gold Mine, 30 km N of Yunta, Oct 1968, *Carrick 1724* (AD); Beresford Hill, Oct 1978, *Chorney 992* (AD [mixed collection with *E. centralis*], NSW); Bongadillina Creek, Warrina, 130 km N of William Creek, Jun 1985, *Conrick 1801* (AD); c. 10 km SSW of Mt Gunson Copper Mines W of Pernatty Lagoon, Oct 1966, *Eichler 18833* (AD); picnic ground c. 6 miles (c. 9 km) W of Marree, Jul 1955, *Hill 100* (AD); Evelyn Downs, Oct 1955, *Ising s.n.* (AD 966150240); c. 22 km of Stuart Creek crossing (near Blower Waterhole) on track to Coward Springs from Stuart Creek homestead, Mar 1984, *Jackson 5147* (AD); Mt Lyndhurst, Oct 1898, *Koch 245* (AD); Carrierloo Station, 3 km E of homestead, Jun 1992, *Michael 353* (AD); Carrierloo Station, 1 km NW of SE corner of Horseshoe paddock, Mar 1993, *Michael 536* (AD); c. 2 km NE of Gordon, c. 16 km SW of Hawker, Oct 1958, *Schodde 965* (AD); Dalhousie, Jun 1987, *Symon 14569b*. **New South Wales.** 18.6 km N of Tibbooburra on Silver City Highway in Sturt N.P., Sep 1989, *Coveny 13612 et al.* (NSW).

Distribution and habitat: *Euphorbia thelephora* var. *australis* extends from near Finke, NT, south east to near Yunta, SA, with disjunct populations in western NSW and north-western Qld (**Map 51b**). It grows in herbland communities on clayey loam or clay soils on gibber plains, in low open shrubland communities on skeletal clay soils on rocky calcareous/gypseous hills, or in loam or sandy clay soils on alluvial flats or creek banks.

Phenology: Flowers and fruits have been collected in January, March to October.

Notes: *Euphorbia thelephora* var. *australis* differs from *E. thelephora* var. *thelephora* by having a sparse to dense indumentum on its stems and leaves (versus glabrous or with a few scattered hairs for *E. thelephora* var. *thelephora*) and 5–13 staminate flowers per cyathium (versus 1–4 staminate flowers for *E. thelephora* var. *thelephora*). *Euphorbia thelephora* var. *australis* differs from *E. thelephora* var. *rugosa* by having a smooth seed surface (versus seed surface with numerous prominent narrow rounded \pm transverse ridges).

Etymology: The varietal epithet is Latin *australis*, south, southern, in reference to this variety's distribution in relation to that of the other varieties of this species.

51c. *Euphorbia thelephora* var. *rugosa* Halford & W.K.Harris, **varietas nova** ab aliis varietatibus *E. thelephorae* seminis superficiei porcis \pm transversis multis prominentibus angustis rotundatis praedita (ad vicem superficiei laevi) necnon ab *E. thelephora* var. *thelephora* indumento caulium foliorumque sparso usque denso (ad vicem glabro vel pilis paucis dispersis) et floribus staminatis 7–10 in quoque cyathio (ad vicem floribus staminatis 1–4 in quoque cyathio) differt. **Typus:** Northern Territory. 5 km W along Hatt Road from Stuart Highway, S of Alice Springs, 18 October 2011, *D.Halford QM614* (holo: BRI; iso: AD, DNA, MEL, MICH, *distribuendi*).

Stem with a dense indumentum of spreading hairs to 0.8 mm long. **Leaves:** adaxial and abaxial surfaces with a dense indumentum of spreading hairs to 0.8 mm long. **Involucres** cupuliform, 0.8–1.4 mm long, 0.9–1.4 mm

across; glands cupuliform, with distinct tangential trough and thickened rim, transverse-oblong in outline, 0.2–0.3 mm long; 0.3–0.5 mm wide, red; gland appendages conspicuous, transverse-oblong, 0.2–0.3 mm long, 0.6–1 mm wide, pink to red. **Staminate flowers** 7–10 per cyathium. **Capsules** elliptic in lateral view, papillose (rarely smooth), densely hairy with weakly spreading hairs 0.3–0.5 mm long. Seeds narrow-ovate to ovate, dorsal and ventral faces with numerous prominent narrow rounded \pm transverse ridges. $n = 11$. **Fig. 28E**.

Additional selected specimens examined: **Northern Territory.** Manners Creek homestead, Sep 1954, *Chippendale 390* (NSW); 5 km W of Stuart Highway, road to Pine Gap, Dec 1993, *Albrecht 5728* (NT); c. 4 km NW Mt Ebenezer homestead, Oct 1992, *Nelson 2860* (DNA); Horseshoe Bend Road, 5 km N of Lilla Creek, Aug 1988, *Barritt 776* (DNA) [mixed collection with *E. thelephora* var. *australis*]. **Queensland.** GREGORY NORTH DISTRICT: c. 73 km S of Cloncurry, May 1976, *Hassall 7643* (BRI); Roxborough Downs, Jan 1896, *Bailey s.n.* (BRI [AQ202490]) [mixed collection with *E. thelephora* var. *australis*]; Glenormiston, 10 miles [c. 16 km] W of homestead, Aug 1949, *Colliver s.n.* (BRI [AQ202489]); 23 km NE of Old Cork homestead, near Diamantina River, Nov 1986, *Neldner 2599 & Nicolson* (BRI); Currawilla, c. 100 miles [c. 161 km] W of Windorah, Jun 1949, *Everist 3913* (BRI); Georgina River, Sep 1910, *Bick 101* (BRI). **South Australia.** Dalhousie, Jun 1987, *Symon 14568* (AD); Macumba, s.d., *Tate 126* (AD).

Distribution and habitat: *Euphorbia thelephora* var. *rugosa* occurs in central Australia from Mt Ebenezer, in southern NT and Macumba, in northern SA, north east to the Diamantina River, in western Qld (**Map 51c**). It grows in *Acacia* shrubland or woodland communities on sandy loam, clay loam or stony clay soils on plains or low calcareous hills.

Phenology: Flowers and fruits have been recorded in January, May, June, and from August to November.

Notes: *Euphorbia thelephora* var. *rugosa* differs from the other varieties of *E. thelephora* by having a seed surface with numerous prominent narrow rounded \pm transverse ridges (versus smooth seed surface for the other *E. thelephora* varieties). *Euphorbia thelephora* var. *rugosa* also differs from *E. thelephora* var. *thelephora* by having a sparse to dense indumentum on its stems and leaves

(versus glabrous or with a few scattered hairs for *E. thelephora* var. *thelephora*) and 7–10 staminate flowers per cyathium (versus 1–4 staminate flowers for *E. thelephora* var. *thelephora*).

Etymology: The varietal epithet is from Latin *rugosus*, wrinkled, in reference to the seed surface texture of this variety.

52. *Euphorbia thymifolia L., *Sp. Pl.* 1: 454 (1753); *Chamaesyce thymifolia* (L.) Millsp., *Publ. Field Mus., Bot. Ser.* 2(11): 412 (1916). **Type:** “habitat in India” (lecto: LINN [*Herb. Linn. No. 630.10*] n.v. (IDC microfiche 177.320: III. 3), *fide* Wheeler [1941: 253]).

Illustration: Lin *et al.* (1991: 248, fig. 20), as *Chamaesyce thymifolia*.

Monoecious, herbaceous perennial, with many annual stems arising from crown of slender taproot. **Stems** prostrate, much branched, smooth, with a moderately dense indumentum on upper surface; hairs appressed to ascending, crispate, to 0.4 mm long, white. **Interpetiolar stipules** subulate, 0.5–1.3 mm long, bipartite, indumentum as for stems; margin lacinate. **Leaves:** petiole 0.8–1 mm long, smooth, glabrous or with a few scattered hairs; blade oblong to ovate, elliptic or oblong-elliptic, 5–8 mm long, 2.5–5 mm wide, 1.6–1.8 times longer than wide; adaxial surface green to blue green, occasionally red, smooth, glabrous; abaxial surface pale green, smooth, with a sparse to moderately dense indumentum consisting of appressed-ascending, crispate hairs 0.3–0.4 mm long; base asymmetric with one side rounded to shallowly cordate, the other obtuse to rounded; margin serrulate, sometimes only distally; apex rounded. **Cyathia** solitary at the nodes, but often clustered on short leafy axillary branchlets with subtending leaves usually much smaller than primary stem leaves; peduncles 0.2–0.5 mm long, smooth, glabrous. **Involucres** turbinate, 0.5–0.8 mm long, c. 0.5 mm across; lobes 5, triangular, c. 0.2 mm long, margin fimbriate; glands 4, stipitate, patelliform, shallowly concave, transverse-oblong to transverse-elliptic in outline, c. 0.1 mm long, 0.2–0.3 mm wide, red; gland appendages inconspicuous, spreading

radially, transverse-oblong or obdeltoid, c. 0.1 mm long and 0.2 mm wide, white to pink, glabrous, margin entire or shallowly lobed; bracteoles 0.5–0.6 mm long, adnate for c. 1/5 of their length to involucre, free portion divided into \pm linear hairy segments. **Staminate flowers** 3–5 per cyathium; pedicels 0.7–0.8 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.7 mm long, spreading, smooth, glabrous, each bifid for 1/2–2/3 of their length, the apices terete. **Capsules** at maturity on pedicel 0.5–0.6 mm long, not completely exerted from involucre, rupturing side of involucre, broad to very broad-ovate in lateral view, c. 1 mm long, 1–1.1 mm across, shallowly 3-lobate with keels acute, smooth, with a moderately dense indumentum; hairs appressed, 0.1–0.2 mm long; hypogynous disc entire. **Seeds** ovate in outline, 0.6–0.8 mm long, 0.4–0.5 mm tangentially, 0.4–0.5 mm radially, tetraquetrous in cross section; dorsal and ventral surfaces concave with 3 or 4 distinct, narrow, rounded, transverse ridges; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown. **Fig. 28F.**

Additional selected specimens examined: **Western Australia.** Broome, May 1991, *Thomson 3481* (NT). **Northern Territory.** Palmerston, Driver High School, Jan 1995, *Cowie 5179* (BRI, MEL); Howard Springs Nature Park, Jun 1984, *Rankin 2961* (DNA). **Queensland.** COOK DISTRICT: Injinoo, Mar 1993, *Waterhouse BMW2813* (BRI); Heathlands, Mar 1992, *Johnson 5199 & Sharpe* (BRI); Beames Street, Mareeba, Apr 1983, *Clarkson 4597* (BRI); Cowley Beach, Feb 1978, *Hopkins 1511 & Graham* (BRI). BURKE DISTRICT: Gregory River crossing, Riversleigh Station, May 1990, *Latz 11638* (DNA). NORTH KENNEDY DISTRICT: Townsville, Feb 1980, *Stanley 8051* (BRI); Bowen, Delta Horticultural Research Station, Jul 1980, *Swarbrick WNA28* (BRI). SOUTH KENNEDY DISTRICT: edge of Eungella Dam, W of Eungella, Feb 2003, *Bean 20068 & Champion* (BRI). PORT CURTIS DISTRICT: Mt Morgan Railway Station, Nov 2004, *Batianoff 0411545 & Halford* (BRI). MORETON DISTRICT: 2 Orion Court, Rothwell, northern suburb of Brisbane, Mar 2007, *Austin s.n.* (BRI [AQ790414]).

Distribution and habitat: *Euphorbia thymifolia* is most likely native to the New World, but has become widely naturalised in the Old World tropics. In Australia it has become naturalised in the coastal tropical and subtropical regions of Qld with isolated

occurrences in Broome, WA, the Darwin region, NT and Riversleigh Station, north-western Qld (**Map 52**). It grows mostly in sunny situations on disturbed ground, lawns, garden beds, and is frequently recorded growing along pathways.

Phenology: Flowers and fruits have been recorded from November to August.

Notes: *Euphorbia thymifolia* may be confused with another two introduced weedy species, *E. maculata* and *E. prostrata*. It is distinguished from both of these species in having generally smaller capsules and seeds, longer and more divided style limbs, and the capsules on short pedicels at maturity causing the involucre to split.

53. *Euphorbia trigonosperma* Halford & W.K.Harris, **species nova** similis *E. biconvexae* Domin et *E. coghlanii* F.M.Bailey sed seminibus trigonis transversaliter (ad vicem seminibus lenticularibus in *E. biconvexa* et suborbicularibus in *E. coghlanii*) differt. **Typus:** Queensland. COOK DISTRICT: eastern flank of Newcastle Range, W of Mount Surprise, 27 December 2006, K.R.McDonald KRM6016 (holo: BRI).

Euphorbia mitchelliana var. *glauca* Benth., *Fl. Austral.* 6: 47 (1873). **Type:** [Western Australia.] Nickol Bay, [in 1861,] Gregory Expedition [*P.Walcott s.n.*] (lecto [here designated]: MEL 1560383).

Euphorbia sp. Hale River (B.G. Thomson 3395); Short *et al.* (2011: 31).

Monoecious, herbaceous perennial to 50 (100) cm high, few stems arising from slender woody taproot. **Stems** mostly erect or sometimes decumbent to ascending, sparingly to much branched, smooth, with a sparse to moderately dense indumentum or glabrous; hairs spreading, \pm straight, 0.2–0.5 mm long, white. **Interpetiolar stipules** narrow-triangular, 0.8–1.4 mm long, entire, bifid or bipartite, glabrous; margin entire. **Leaves:** petiole 0.8–1.2 mm long, smooth, glabrous; blade narrow-oblong or ovate, sometimes falcate, 12–30 mm long, 4–13 mm wide, 1.6–4.2 times longer than wide; adaxial surface light to dark green or grey

green, smooth (rarely minutely papillose), glabrous; abaxial surface paler than adaxial surface, smooth (rarely minutely papillose), glabrous or (rarely with scattered spreading hairs *c.* 1 mm long); base asymmetric or symmetric with one side cordate, the other rounded or cordate; margin entire or sparingly minutely or coarsely toothed; apex rounded, obtuse or acute. **Cyathia** solitary at the nodes, but mostly clustered in congested monochasial or dichasial cymes on shortened axillary branchlets with subtending leaves much smaller primary stem leaves; cyathial peduncles 1–10 mm long. **Involucres** campanulate or turbinate, 1–1.8 mm long, 0.9–2 mm across; lobes 5, triangular to subulate, 0.4–1.1 mm long, margin lacinate; glands 4, stipitate, patelliform, planar, transverse-oblong or orbicular in outline, 0.2–0.4 mm long, 0.2–1 mm wide, green or yellowish green; gland appendages conspicuous (rarely absent), spreading radially, transverse-elliptic or very broad-obovate, 0.1–1.6 mm long, 0.4–2.3 mm wide, white, pink or yellowish-white, glabrous, margin entire; bracteoles 1–1.5 mm long, adnate for 1/2–2/3 of their length to involucre, free portion divided into numerous subulate glabrous segments. **Staminate flowers** 2–32 per cyathium; pedicels 0.9–2.2 mm long; staminal filaments 0.3–0.6 mm long. **Pistillate flowers:** styles 0.8–1.5 mm long, connate at the base into a column for up to 1/5 of their length, spreading, sometimes recurved distally, smooth, glabrous, each bifid for 1/2–2/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 4 mm long, elliptic in lateral view, 1.5–2.1 mm long, 1.9–2.6 mm across, deeply 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** ovate or elliptic in outline, (1)1.2–1.6 mm long, 0.6–1 mm tangentially, 0.8–1 mm radially, trigonal in cross section; dorsal faces convex, smooth; ventral faces planar or convex, smooth; exotesta thin, of even thickness over surface, pale brown, microreticulate, becoming mucilaginous when moistened; endotesta dark brown. **Figs 21, 28G.**

Additional selected specimens examined: **Western Australia.** block 16 along track next to main channel, Kununurra, Mar 1978, *Aplin 6315* (BRI, PERTH); 6 km SW of Mt Chalmers and 26 km from Dog Chain Creek on road to Derby, Jun 1988, *Wilson 12931* (PERTH); 86 km NE of Sandfire Roadhouse, Great Northern Highway, Sep 1978, *Beaglehole ACB59231 & Errey* (PERTH); Munda Creek, Mundabullangana Station, W of Port Hedland, Feb 1962, *George 3369* (PERTH); Gregory Gorge, W Millstream, May 1976, *Keighery 738* (PERTH); Hamersley Range N.P., first hill on east side of road to Hancock Gorge from Mt Bruce – Mt Tom Price Road, May 1980, *Trudgen 2688* (PERTH); 33 miles [c. 53 km] N of Carnarvon on road to Quobba, Feb 1962, *George 3255* (PERTH). **Northern Territory.** Gregory N.P., Feb 1992, *Cowie 2212 & Brocklehurst* (MEL); Gold Creek, Wollgorang, Jan 1989, *Russell-Smith 6890 & Lucas* (DNA); Upper Robinson River, Jan 1989, *Thomson 3060* (BRI, DNA); Birrindudu, Jun 1994, *Egan 3776* (DNA); 26 km NW Barkly homestead, Apr 1993, *Parsons 388* (DNA); 13 km SSE [of] Sangsters Bore, Tanami Desert, Jun 1991, *Latz 11958* (MEL); Amarata Waterhole, Hale River, Nov 1989, *Thomson 3395* (DNA). **Queensland.** BURKE DISTRICT: 34.6 km SW of Hells Gate Roadhouse, turn off Lagoons, Apr 2006, *Thompson WES292 & Edginton* (BRI); Lawn Hill N.P., Musselbrook section, Murray Springs, Apr 2003, *Booth 3205 & Kelman* (BRI); E of Jump-up, 33.6 km (by road) E of Musselbrook Mining Camp, May 1995, *Johnson MRS1028 & Thomas* (BRI); 30 miles [c. 48 km] SE of Riversleigh Station, Jun 1948, *Perry 1428* (DNA); 11 km N and 2 km W of Mt Isa, Jun 1983, *Schmid 654* (BRI); c. 7 km NW of Croydon, just W of Welcome Creek, Dec 1998, *Wannan 980* (BRI); 14.9 km by road from Georgetown towards Forsyth, Feb 2006, *McDonald KRM4841* (BRI). **South Australia.** Christmas Creek near Crispe Bore, May 1987, *Symon 14390* (AD).

Distribution and habitat: *Euphorbia trigonosperma* occurs across northern Australia from the Pilbara and Kimberley, WA, extending through the northern central area of NT, and eastward to north-western Qld, with outlying occurrences in southern NT and far northern SA (**Map 53**). It grows in grassland, shrubland or woodland communities, in sandy soils on coastal or inland dunes, in well-drained sandy soils on stony slopes of sandstone or limestone hills, and in sandy alluvium along drainage lines.

Phenology: Flowers and fruits have been collected throughout the year, particularly from January to September.

Notes: *Euphorbia trigonosperma* seems most closely related to *E. biconvexa* and *E. coghlanii*. It differs from both species in having seeds that are trigonous in transverse section (versus lenticulate for *E. biconvexa*

and suborbicular for *E. coghlanii*), larger involucre glands ($0.2\text{--}0.4 \times 0.2\text{--}1$ mm versus $0.1\text{--}0.2 \times 0.1\text{--}0.6$ mm for *E. biconvexa* and *E. coghlanii*) and longer styles (0.8–1.5 mm long versus 0.4–0.8 mm for *E. biconvexa* and *E. coghlanii*).

This species as circumscribed here varies considerably in the shape and thickness of its leaf blades, number of staminate flowers per cyathia and size of its gland appendages. Further collections and field studies are warranted to establish the significance of this variation.

54. *Euphorbia vaccaria* Baill., *Adansonia* 6: 286 (1866). Type: [Western Australia.] Hierson Island, Nickol [Nichol] Bay, *s.d.*, *P. Walcott s.n.* (lecto: MEL 1551017, *fide* Thomson [1992: 354]; isolecto: P 313104).

Monoecious, herbaceous perennial to 2 cm high, with many annual stems arising from a thickened woody taproot. **Stems** prostrate, sparingly to much branched, smooth, with a sparse to moderately dense indumentum; hairs spreading, \pm straight, 0.8–1.8 mm long, white. **Interpetiolar stipules** narrow-triangular, 0.7–0.8 mm long, deeply bipartite, with indumentum as for stems; margin lacinate. **Leaves:** petiole 1–1.5 mm long, smooth, with indumentum as for stems; blade oblong, oblong-elliptic, ovate or obovate, 4–9 mm long, 1.5–4 mm wide, 1.2–2.5 times longer than wide; adaxial and abaxial surfaces pale green to green, smooth, with moderately dense to dense indumentum consisting of ascending to spreading, straight hairs 0.3–1 mm long; base asymmetric with one side truncate, cordate to obtuse, the other cuneate to obtuse or rounded; margin entire or minutely toothed distally; apex obtuse to rounded. **Cyathia** solitary at the nodes, often clustered on short leafy lateral branchlets with subtending leaves slightly smaller than primary stem leaves; peduncles 0.2–1.2 mm long, smooth, hairy. **Involucres** campanulate, 1.3–2 mm long, 0.8–1.4 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin entire; glands 4, stipitate, cupuliform, with tangential trough, transverse-oblong in outline, 0.1–0.2 mm long, 0.2–0.4 mm wide, dark red; gland appendages conspicuous, spreading radially,

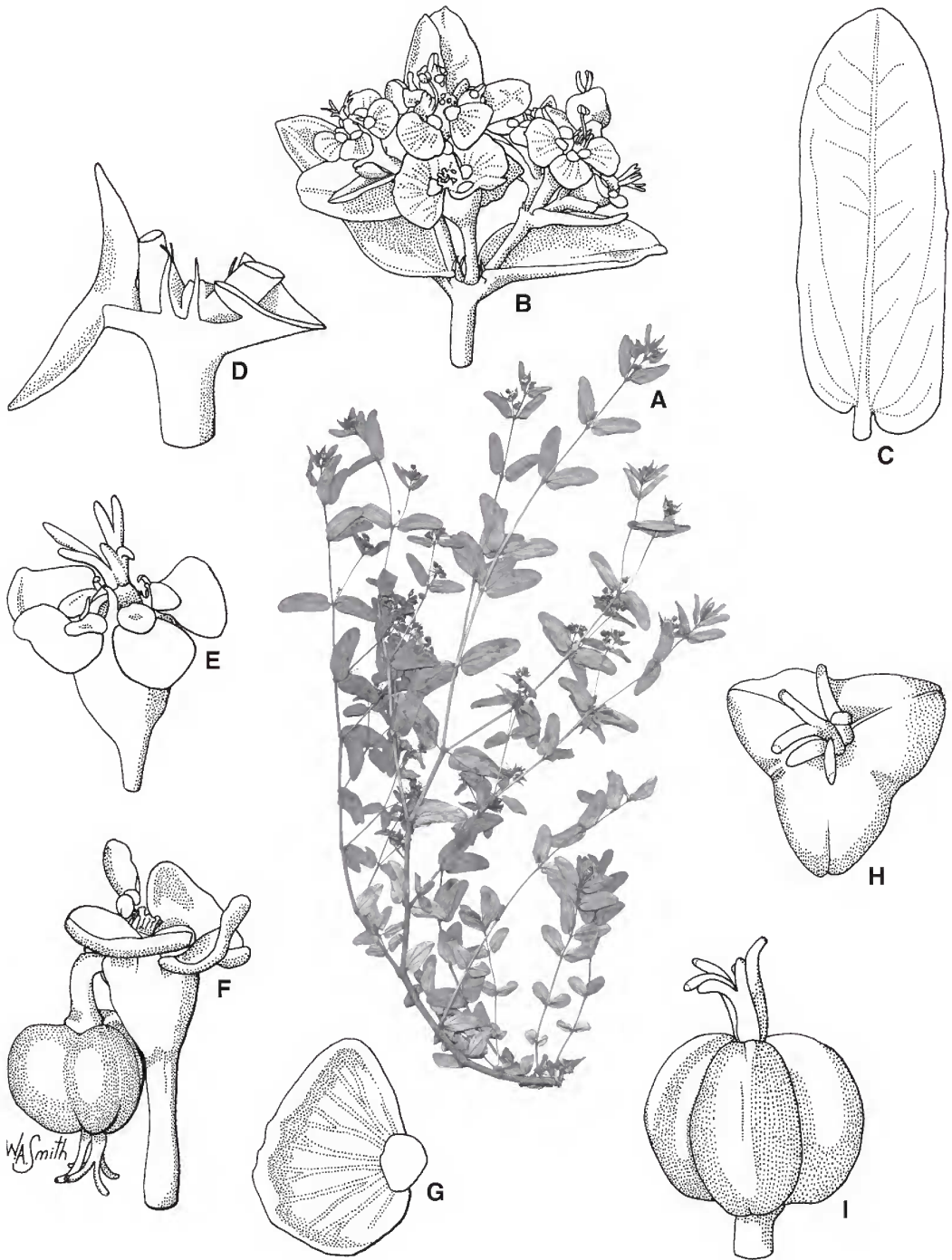


Fig. 21. *Euphorbia trigonosperma*. A. habit $\times 0.4$. B. branchlet with cyathia $\times 4$. C. leaf $\times 2$. D. stipules $\times 8$. E. cyathia with female flower $\times 12$. F. cyathia with immature capsule $\times 8$. G. cyathial gland with appendage, adaxial view $\times 12$. H. capsule, top view $\times 12$. I. capsule, lateral view $\times 12$. A from McDonald KRM6016 (BRI); B–I from Thompson WES292 & Edginton (BRI). Del. W. Smith.

obdeltoid, 0.3–0.5 mm long, 0.6–1 mm wide, pink, red or white, glabrous, margin toothed or irregularly lobed; bracteoles 0.6–0.8 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into \pm linear hairy or glabrous segments. **Staminate flowers** 3–5 per cyathium; pedicels 1.2–1.6 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers**: styles 0.3–0.5 mm long, ascending and spreading distally, minutely papillose, glabrous, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3 mm long, broad to very broad-ovate in lateral view, 1.3–1.7 mm long, 1.2–1.9 mm across, shallowly 3-lobate with keels obtuse, smooth or minutely papillose, with a dense indumentum mostly confined to the proximal half of the capsule; hairs spreading, to 1.5 mm long; hypogynous disc entire. **Seeds** ovate in outline, 0.8–1.2 mm long, 0.5–0.9 mm tangentially, 0.5–0.8 mm radially, tetraquetrous in cross section; dorsal faces \pm planar or slightly concave, with faint narrow rounded irregular ridges; ventral faces concave, \pm smooth; exotesta thin, of even thickness over surface, grey-white

or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta pale brown or reddish brown.

Distribution and habitat: *Euphorbia vaccaria* occurs from near Onslow, WA east to Victoria River Crossing and the Tanami Desert, NT.

Notes: *Euphorbia vaccaria* is similar to and often grows with *E. australis* var. *subtomentosa* where their distributions overlap. *Euphorbia vaccaria* differs from *E. australis* by the indumentum of the capsules being confined to the proximal half of the capsule and consisting of hairs 0.8–1.5 mm long (versus hairs evenly distributed over the capsule surface and consisting of hairs up to 0.7 mm long for *E. australis*).

Euphorbia vaccaria exhibits some discontinuous variation in indumentum and leaf characters with little geographical discontinuity. This variation is considered sufficient to warrant formal recognition of two varieties within this species which can be distinguished using the following key.

Key to varieties of *Euphorbia vaccaria*

- Leaves subtending cyathia on short lateral branchlets entire or minutely toothed; indumentum 0.8–1 mm long **54a. *E. vaccaria* var. *vaccaria***
 Leaves subtending cyathia on short lateral branchlets distinctly toothed distally; indumentum 1–1.8 mm long. **54b. *E. vaccaria* var. *erucoides***

54a. *Euphorbia vaccaria* var. *vaccaria*

Stems prostrate, with a moderately dense indumentum; hairs 0.8–1 mm long. **Leaf blades** oblong, ovate or obovate, 4–8 mm long, 2–4 mm wide, 1.6–2.5 times longer than wide; adaxial and abaxial surfaces with a moderately dense indumentum of hairs 0.3–1 mm long; base asymmetric with one side truncate to shallowly cordate, the other rounded; margin entire or minutely toothed distally; apex obtuse to rounded. **Involucral gland appendages** 0.1–0.4 mm long, c. 0.5 mm wide, pink, red or white, margin toothed or irregularly lobed. **Pistillate flowers** with styles 0.3–0.4 mm long. **Capsules** exserted

from involucre on pedicel to 2.5 mm long, 1.3–1.7 mm long, 1.2–1.7 mm across, hairs to 0.8 mm long. **Fig. 28H.**

Additional selected specimens examined: Western Australia. Cape Boileau, 35 km N of Broome, May 1991, *Thomson 3484* (DNA); 436.3 km NE of Port Hedland towards Broome, Sep 1995, *Lally TRL711* (BRI); 258 km SW of La Grange Mission turnoff, Great Northern Highway, Aug 1974, *Beaglehole ACB48293 & Carr* (PERTH); Nalgi Station, Jul 1941, *Burbidge 1341* (PERTH); Anna Plains, Jul 1941, *Burbidge 1477* (PERTH); Great Sandy Desert, May 1984, *Fatchen 849* (AD); 44 km (by road) along North West Coastal Highway from Roebourne towards Whim Creek, Sep 2006, *Halford Q9150* (BRI); Chichester Range, c. 13 km N of Roebourne – Wittenoom Road, N of Mt Florence, Sep 2006, *Halford Q9269* (BRI); 49.4 km N (by road) of Auski Roadhouse along Great Northern Highway, Sep

2006, *Halford Q9181a* (BRI); SW corner of Cane River Station, 80 km SE of Onslow, May 1999, *Edinger 1455* (PERTH); 2 km NE of North West Coastal Highway, in southern section of Cane River Station, May 1999, *Edinger 1665* (PERTH); 0.7 km SSW of Packsaddle Hill, Hamersley Ranges, Sep 1997, *Trudgen 16607* (PERTH); 31.3 km S of Nullagine on Nullagine – Newman Road, Aug 2004, *Harris WKH2235* (BRI); Patience Well, Gibson Desert, Jun 2001, *Campbell 2489* (PERTH); Bungle Bungle N.P., Ord River at Blue Holes, Jul 1989, *Menkhorst 695* (DNA). **Northern Territory.** 28.9 km E of Victoria River Crossing, Gregory N.P., Jun 2000, *Kerrigan 213* & *Risler* (DNA); 5 miles [c. 8 km] SSE [of] Mongrel Downs homestead, Aug 1970, *Latz 750* (AD, DNA); 45 miles [c. 72 km] SW [of] Mongrel Downs homestead, Aug 1970, *Parker 283* (DNA, MEL, NSW); 46 miles [c. 74 km] E [of] Mongrel Downs homestead, Apr 1971, *Dunlop 2108* (DNA); Lake Mackay, Oct 1992, *Latz 12845* (MEL).

Distribution and habitat: *Euphorbia vaccaria* var. *vaccaria* is found from near Onslow, WA east to Victoria River Crossing and the Tanami Desert, NT (**Map 54a**). It grows in hummock grassland, *Eucalyptus*/*Acacia* shrubland/woodland communities on sandy loam to sandy clay soils on alluvial flats, or stony plains or hills. It has also been recorded growing on the margins of salt pans.

Phenology: Flowers and fruits have been collected mostly from April to September.

54b. *Euphorbia vaccaria* var. *erucoides* Halford & W.K.Harris, **varietas nova** ab *E. vaccaria* var. *vaccaria* foliis subtendentibus distaliter dentatis (ad vicem foliis integris vel minute dentatis) 1–1.8 mm longi (ad vicem pilis 0.8–1 mm longis), glandulae appendicibus plerumque longioribus 0.3–0.5 mm longis (ad vicem appendicibus 0.1–0.4 mm longis) differt. **Typus:** Western Australia. Fortescue River floodplain, c. 15 km N of Auski Roadhouse, old Great Northern Highway, 15 September 2006, *D.Halford Q9188* (holo: BRI; iso: MEL, PERTH).

Stems prostrate, with a sparse to moderately dense indumentum; hairs 1–1.8 mm long. **Leaf blades** obovate or oblong-elliptic, 4–9 mm long, 1.5–4 mm wide, 1.2–2.5 times longer than wide; adaxial and abaxial surfaces with sparse or moderately dense indumentum of hairs 0.5–1 mm long; base asymmetric with one side cordate to obtuse, the other cuneate to obtuse; margin toothed distally; apex rounded. **Involucral gland**

appendages 0.3–0.5 mm long, 0.6–1 mm wide, red, margin shallowly irregularly lobed. **Pistillate flowers** with styles 0.4–0.5 mm long. **Capsules** exerted from involucre on pedicel to 3 mm long, 1.4–1.5 mm long, 1.6–1.9 mm across, hairs 1–1.5 mm long.

Additional selected specimens examined: Western Australia. Gregory Gorge, c. 20 km downstream from Millstream, May 1976, *Keighery 779* (PERTH); Millstream, Sep 1969, *Brooker 2057* (PERTH); Oakover River, 19 km S of Two Sisters, c. 160 km SE of Shay Gap, July 1984, *Newbey 10424* (PERTH); near northern shore of Guli Lake, Canning Stock Route, Aug 1989, *Barker 191* (PERTH); Cave Creek, 15 km NW of Mt Brockman Station (abandoned) on homestead block, Jul 1999, *Backhouse BEM14 et al.* (PERTH); Caves Creek, Hamersley Station, c. 75 km along Mt Brockman road W of Hamersley Station homestead, Sep 2006, *Halford Q9521* (BRI); Caves Creek, Mt Brockman road 50 km W of Hamersley Station homestead, Sep 2006, *Halford Q9256* (BRI); Hamersley Range N.P., 0.3 km from Mindi Spring on track to Coppin Pools, May 1980, *Trudgen 2615* (PERTH); Turee Creek, 1.5 km W of Mindi Springs, Hamersley Range N.P., Jun 1975, *Trudgen 1351* (PERTH); Hamersley Range N.P., 2.3 km from Mindi Springs on track to Milli Milli Springs, May 1980, *Trudgen 2385* (PERTH); 25 km E of Karijini Drive along service road of Hamersley Iron railway, Sep 2006, *Halford Q9208* (BRI); Roy Hill to Munjina Road, 7.2 km W of intersection with Nullagine – Newman Road, Sep 2004, *Harris WKH2238* (BRI); Turee Creek, Turee Station, c. 40 km E of Paraburdoo, Sep 2006, *Halford Q9233B* (BRI); 14.5 km W of Rhodes Ridge on Weeli Wolli Creek Road, Aug 1973, *Trudgen 420* (PERTH); Mundiwindi, Great Northern Highway, Jun 1970, *Briggs 3603* (NSW, PERTH); Little Sandy Desert, 26.6 km ESE of Burranbar Pool on Savory Creek, 37.9 km NE of Cooma Well, 61.8 km N of Terminal Lake, 38.9 km NNW of the Dean Hills, Apr 1997, *van Leeuwen 3043* (BRI).

Distribution and habitat: *Euphorbia vaccaria* var. *erucoides* occurs in the Chichester and Hamersley Ranges, and extending eastward to Guli Lake, in the Great Sandy Desert (**Map 54b**). It grows in *Eucalyptus*/*Melaleuca* riparian forest or woodland communities on sandy loam to loam or gravelly alluvium in dry river beds, on creek and river banks or alluvial flats, and in hummock grassland, mallee or mulga woodland communities on sandy loam to sandy clay soils often with calcrete on plains.

Phenology: Flowers and fruits have been collected from mostly from May to September.

Notes: *Euphorbia vaccaria* var. *erucoides* differs from *E. vaccaria* var. *vaccaria* in having subtending leaves distinctly toothed distally (versus entire or minutely toothed for *E. vaccaria* var. *vaccaria*), indumentum 1–1.8 mm long (versus 0.8–1 mm long for *E. vaccaria* var. *vaccaria*) and generally longer gland appendages, 0.3–0.5 mm long (versus 0.1–0.4 mm long for *E. vaccaria* var. *vaccaria*).

Etymology: The varietal epithet is Latin *eruca*, caterpillar, and *-oides*, like, resembling, in reference to the colloquial name ‘caterpillar plant’ used by ecological investigators in the Pilbara region for this taxon. The cyathia are clustered on short leafy lateral branchlets, the clusters somewhat resemble a hairy caterpillar.

55. *Euphorbia verrucitesta* Halford & W.K.Harris, **species nova** ut videtur arcte affinis *E. philochalicis* Halford & W.K.Harris sed glandulae appendicibus brevioribus c. 0.5 mm longis (ad vicem appendicibus 0.1–0.3 mm longis), seminibus plerumque longioribus 1.1–1.2(1.3) mm longis (ad vicem seminibus 0.9–1.1 mm longis), seminum superficiebus verrucis irregularibus ornatis (ad vicem superficiebus porcis prominentibus irregularibus ornatis) differt. *Euphorbia verrucitesta* habitu generali, glandibus involucralibus, glandulae appendicibus *E. multifariae* Halford & W.K.Harris persimilis sed differt autem capsulis minoribus 1.3–1.5 × 1.5–1.7 mm perlato-ovatis in ambitu (ad vicem capsulis 1.5–1.9 × 1.5–2.1 mm lato-ellipticis in ambitu), seminum superficiebus verrucis irregularibus ornatis (ad vicem superficiebus laevibus vel leviter irregulariter porcatis). Ante hac eandem cum *E. drummondii* Boiss. putata est sed seminum superficiebus verrucis parvis irregularibus (ad vicem superficiebus 3–6 porcis transversis), capsulis minoribus 1.3–1.5 × 1.5–1.7 mm (ad vicem capsulis 1.6–1.8 × 1.7–1.9 mm), seminibus lato-obovatis in ambitu (ad vicem seminibus oblongo-ovatis in ambitu), stylis bifidis 1/3–1/2 longitudinis (ad vicem stylis integris vel vix bifidis) differt. **Typus:** South Australia. 85 km S of Oldea, 25 September 1960, *P. Wilson 1845* (holo: AD).

Monoecious, annual to 5 cm high, many stems arising from slender taproot, the whole plant glabrous. **Stems** prostrate, much branched, smooth. **Interpetiolar stipules** subulate or narrow-triangular, 0.4–1 mm long, bipartite, glabrous; margin lacinate. **Leaves:** petiole 0.3–0.7 mm long, smooth; blade obovate, oblong or oblong-elliptic, 3.5–7 mm long, 2–4.5 mm wide, 1.4–2.1 times longer than wide; adaxial and abaxial surfaces green sometimes with reddish tinge especially along margins, smooth or minutely papillose; base symmetric, rounded to cuneate or asymmetrical with one side cordate or rounded, the other cuneate, obtuse or rounded; margin entire or sparingly minutely toothed distally; apex retuse or rounded. **Cyathia** solitary at the nodes, peduncles 0.3–0.6 mm long. **Involucres** turbinate, 0.8–1.1 mm long, 0.9–1 mm across; lobes 5, triangular, 0.3–0.5 mm long, margin entire, fimbriate or lacinate; glands 4, stipitate, cupuliform, with shallow central pit and somewhat thickened rim, transverse-oblong in outline, 0.1–0.2 mm long, 0.2–0.4 mm wide, red; gland appendages inconspicuous or absent, spreading radially, transverse-linear, obdeltoid or oblong, c. 0.05 mm long, 0.1–0.2 mm wide, pink, glabrous, margin entire; bracteoles 0.5–0.7 mm long, adnate for c. 1/3 of their length to involucre, free portion divided into few subulate glabrous or hirsute segments. **Staminate flowers** 4 or 5 (10) per cyathium; pedicels 0.9–1.1 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.2–0.4 mm long, spreading, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices stout and terete. **Capsules** exserted from involucre on pedicel to 2 mm long, very broad-ovate in lateral view, 1.4–1.5 mm long, 1.5–1.7 mm across, shallowly 3-lobate with keels obtuse, smooth, glabrous; hypogynous disc entire. **Seeds** broad-ovate in outline, 1–1.2(1.3) mm long, 0.7–0.8 mm tangentially, 0.6–0.7 mm radially, tetraquetrous in cross section; dorsal and ventral faces planar or shallowly concave, with prominent rounded irregular wart-like protuberances; exotesta thin, of even thickness over surface, white or pale brown, microreticulate, becoming mucilaginous when moistened; endotesta red-brown. **Figs 22, 281.**

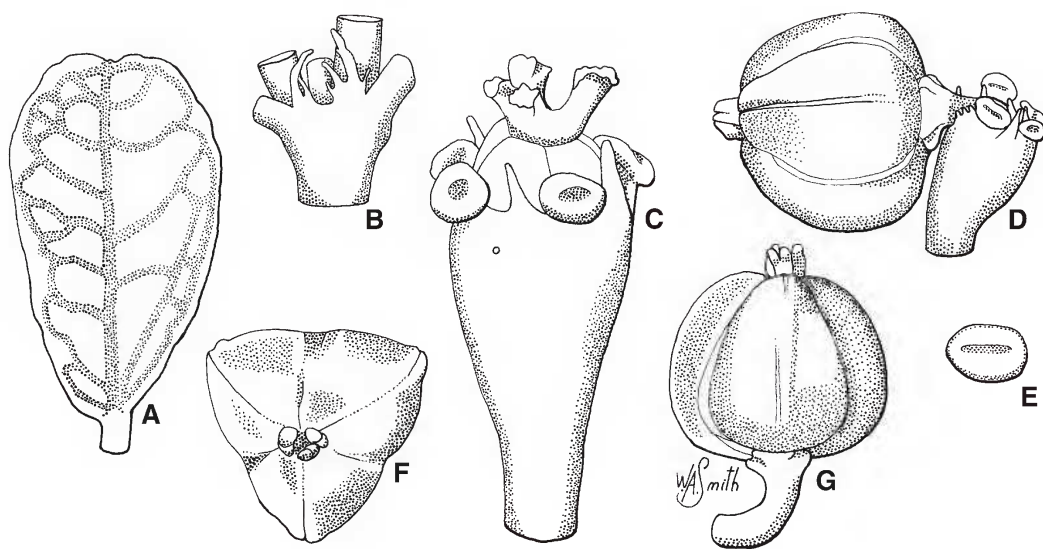


Fig. 22. *Euphorbia verrucitesta*. A. leaf $\times 12$. B. stipules $\times 16$. C. cyathia with female flower $\times 32$. D. cyathia with fruit $\times 16$. E. cyathial gland with appendage, adaxial view $\times 32$. G. capsule, lateral view $\times 16$. F. capsule, top view $\times 16$. All from Wilson 1845 (AD). Del. W.Smith.

Additional selected specimens examined: **Western Australia.** 16 km E of Cocklebidy, Oct 1984, *Keighery* 7543 (PERTH); 104 km S of Neale Junction, Great Victoria Desert, Jul 1974, *George* 11932 (PERTH); 52 km W of Naretha, Jun 1966, *Goodall* 2762 (PERTH). **South Australia.** S of Uno Range near Lake Gilles, Jul 1992, *Bates* 28625 (AD); Koonamore, near 'Bindyi' Research Hut, Aug 1966, *Orchard* 55 (AD); near Shell Hill, Dec 1983, *Spooner* 9115 (AD); R.Lencer Reserve, Punthari, Mar 1997, *Spooner* 16298 (AD). **New South Wales.** 2 km W along N boundary track from main road, then c. 100 m S in Bluff Paddock, Nulla Nulla Station, Nov 2000, *Jobson* 6586 *et al.* (NSW).

Distribution and habitat: *Euphorbia verrucitesta* occurs from near Southern Cross and Esperance, WA, eastward across the Nullarbor through southern SA to far south western NSW (**Map 55**). It has been recorded growing in *Acacia papyrocarpa* Benth. woodland and chenopod shrubland on limestone plains and in *Austrostipa* open grassland on sand plain and interdune swales. It is also recorded on rocky mesas and granite hills. The soils are sands or loams often associated with limestone or gypsum.

Phenology: Flowers and fruits have been collected throughout the year, but mostly in October.

Notes: *Euphorbia verrucitesta* seems most closely related to *E. philochalix*. It may be distinguished from that species by its shorter gland appendages (c. 0.5 mm long versus 0.1–0.3 mm long for *E. philochalix*), generally longer seeds (1.1–1.2(1.3) mm long versus 0.9–1.1 mm long for *E. philochalix*) and irregular wart-like protuberances on the seed surface (versus prominent irregular rounded ridges for *E. philochalix*).

Euphorbia verrucitesta is very similar to *E. multifaria* in general habit, involucre glands and gland appendages. It differs from *E. verrucitesta* by its smaller capsules 1.3–1.5 \times 1.5–1.7 mm that are very broad-ovate in outline (versus 1.5–1.9 \times 1.5–2.1 mm, broad-elliptic in outline for *E. multifaria*) and irregular wart-like protuberances on the seed surface (versus smooth or faintly irregularly ridged seed surface for *E. multifaria*).

Euphorbia verrucitesta has previously been identified as *E. drummondii*, but differs from that species in having small irregular wart-like protuberances on the seed surface (versus seed surfaces with 3–6 distinct transverse ridges for *E. drummondii*), smaller capsules ($1.3\text{--}1.5 \times 1.5\text{--}1.7$ mm versus $1.6\text{--}1.8 \times 1.7\text{--}1.9$ mm for *E. drummondii*), seeds broad-obovate in outline (versus oblong-obovate for *E. drummondii*) and styles that are bifid for $1/3\text{--}1/2$ of their length (versus styles entire or scarcely bifid for *E. drummondii*).

Etymology: The specific epithet is from Latin *verrucus*, warts, and *testa*, seed coat, in reference to the warty appearance of the seed surface of this species.

56. *Euphorbia vicina* Halford & W.K.Harris, **species nova** ante hac eandem falso cum *E. mitchelliana* Boiss. vel *E. schultzei* Benth. putata est. Cum generaliter similem *E. mitchellianae* tamen cyathii in cymis dichasialibus congestis (in vicem cymis laxis terminalis dichasialibus vel aliquando monochasialibus distaliter nascentibus) differt. Ab *E. schultzei* in cymis congestis dispositis (ad vicem solitariis vel in ramulis abbreviatis lateralibus fasciculatis), capsulis $1.4\text{--}1.6 \times 1.9\text{--}2$ mm lato-ellipticis a latere visis leviter 3-lobatis carinis obtusis praeditis (ad vicem capsulis $1.5\text{--}2.2 \times 2\text{--}3$ mm depresso ovatis vel transverse ellipticis usque lato-ellipticis a latere visis valde 3-lobatis carinis acutis praeditis), seminibus tetragonis in sectione transversali (ad vicem seminibus tetraquetris) differt. **Typus:** Western Australia. 5 km N [of] Theda homestead, 2 April 1991, *B.G.Thomson* 3467 (holo: PERTH; iso: NT).

Monoecious, annual to 30 cm high, with few stems arising from slender taproot. **Stems** ascending to erect, sparingly to much branched, smooth, with a sparse to moderately dense indumentum; hairs ascending, curved, 0.2–0.7 mm long, white. **Interpetiolar stipules** narrow-triangular, 0.6–1 mm long, deeply bipartite, glabrous or with indumentum as for stems; margin lacinate with the teeth often gland-tipped. **Leaves:** petiole 1–1.5 mm long, smooth, glabrous or with indumentum as for stems; blade narrow-

ovate to ovate, 12–21 mm long, 2–9 mm wide, 2–5.5 times longer than wide; adaxial and abaxial surfaces green, smooth or minutely papillose, with a sparse to moderately dense indumentum consisting of ascending, curved hairs 0.4–1.2 mm long (rarely glabrous); base asymmetric with one side cordate, the other rounded to obtuse; margin serrulate (rarely entire); apex acute. **Cyathia** clustered in congested dichasial cymes on short axillary branchlets with bracts leaf-like but much smaller than primary stem leaves; cyathial peduncles c. 0.5(2) mm long. **Involucres** turbinate to cupuliform, 0.7–1 mm long, 0.8–1.3 mm across; lobes 5, triangular, 0.5–0.6 mm long, margin entire or lacinate; glands 4, stipitate, cupuliform, with shallow central pit, transverse-oblong to orbicular in outline, 0.2–0.3 mm long, 0.2–0.3 mm wide, red; gland appendages inconspicuous or absent, spreading radially, obdeltoid, c. 0.1 mm long and 0.1 mm wide, pink, glabrous, margin entire; bracteoles 0.4–0.6 mm long, adnate for c. $1/4$ of their length to involucre, free portion divided into \pm linear hairy segments. **Staminate flowers** 5–10 per cyathium; pedicels 0.6–0.8 mm long; staminal filaments 0.1–0.2 mm long. **Pistillate flowers:** styles 0.3–0.4 (0.9) mm long, connate at the base into a column for up to $1/5$ of their length, spreading, \pm smooth, glabrous, each bifid for $1/2\text{--}2/3$ of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 2 mm long, broad-elliptic in lateral view, 1.4–1.6 mm long, 1.9–2 mm across, shallowly 3-lobate with keels obtuse, papillose, with a sparse indumentum consisting of spreading white hairs 0.1–0.3 mm long (rarely glabrous); hypogynous disc entire. **Seeds** broad-ovate in outline, 1.1–1.3 mm long, 0.7–0.8 mm tangentially, 0.7–0.8 mm radially, tetragonous in cross section; dorsal faces \pm convex; ventral faces concave or planar; all faces with faint regularly ridges or with 3 or 4 faint or prominent, acute narrow transverse ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta brown. **Figs 23, 28J.**

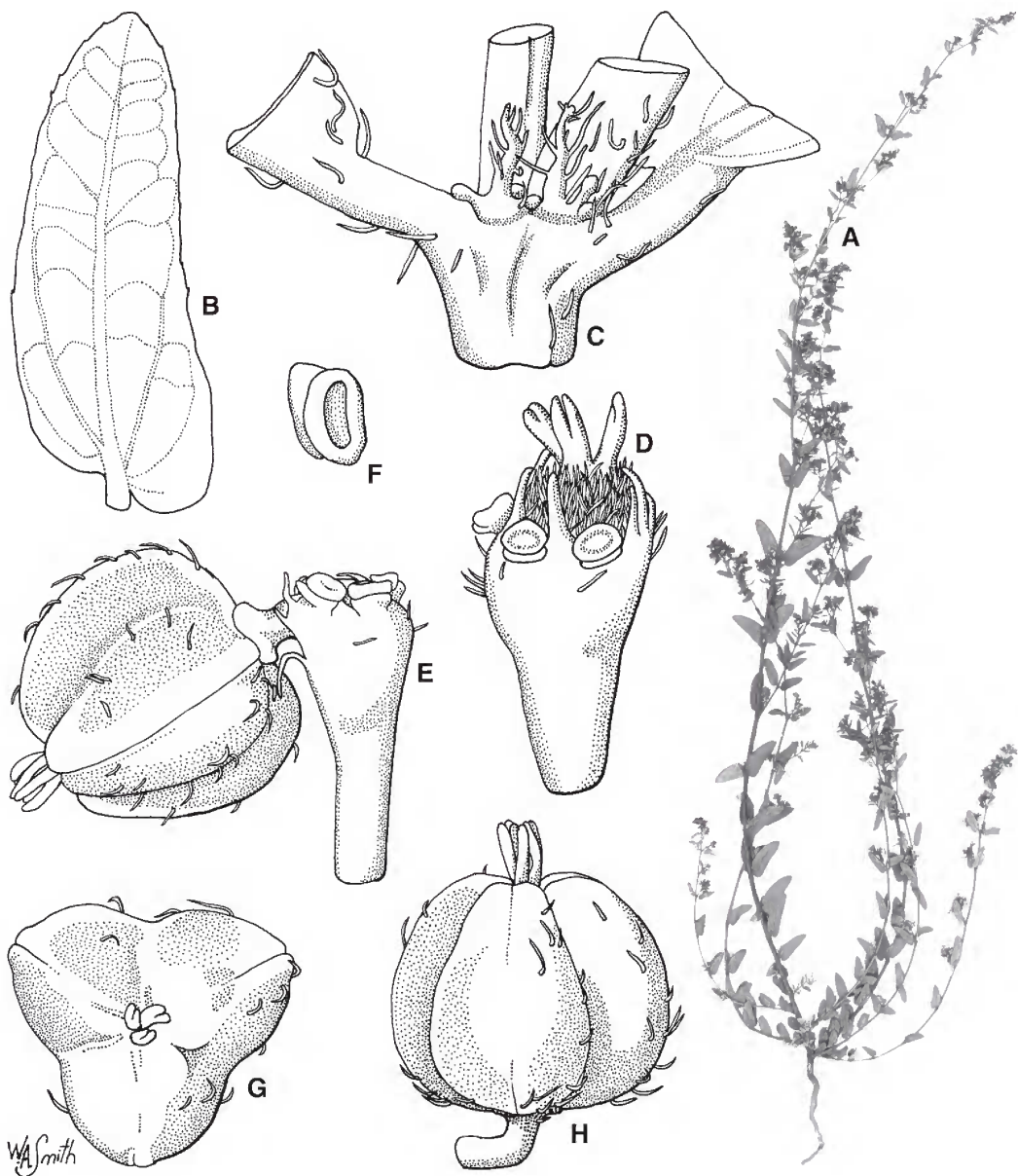


Fig. 23. *Euphorbia vicina*. A. habit $\times 0.4$. B. leaf $\times 4$. C. stipules $\times 24$. D. cyathia with female flower $\times 24$. E. cyathia with capsule $\times 16$. F. cyathial gland with appendage, adaxial view $\times 32$. G. capsule, top view $\times 16$. H. capsule, lateral view $\times 16$. A from Keighery 4928 (PERTH); B–H from Fraser s.n. (PERTH 3079074). Del. W.Smith.

Additional specimens examined: Western Australia. Mitchell Plateau, Apr 1982, *Keighery 4928* (PERTH); ‘Black Mud Swamp’, 24 km from Amax Campsite on road to Mitchell River Station, Jun 1976, *Kenneally 5303/A* (PERTH); summit of Poompangala Hill, c. 8 km W of Kalumburu, Apr 1991, *Willing 249* (PERTH); 2 km E of junction of Charnley and Calder River, Eastern Walcott Inlet, May 1983, *Milewski 207* (PERTH); Mt Hart Station, Feb 1951, *Fraser s.n.* (PERTH 3079066, 3079074).

Distribution and habitat: *Euphorbia vicina* is restricted to the Kimberley, WA, occurring from the Mitchell Plateau and Kalumburu areas south to Mt Hart Station (**Map 56**). It grows in moist areas in hermland, grassland or woodland communities on shallow sandy soils, on lateritic mesas or sandstone plateaux.

Phenology: Flowers and fruits have been collected from February to June.

Notes: *Euphorbia vicina* has been in the past erroneously referred to *E. mitchelliana* or *E. schultzei*. Although *E. vicina* does bear a general resemblance to *E. mitchelliana* it differs from that in having cyathia in congested dichasial cymes (versus lax terminal dichasial or sometimes becoming monochasial distally for *E. mitchelliana*) and capsules with a papillose surface (versus smooth for *E. mitchelliana*).

Euphorbia vicina differs from *E. schultzei* in having cyathia in congested cymes (versus solitary or clustered on shortened leafy lateral branchlets for *E. schultzei*), capsules 1.4–1.6 × 1.9–2 mm, broad-elliptic in lateral view and shallowly 3-lobate with keels obtuse (versus 1.5–2.2 × 2–3 mm, depressed ovate or transverse-elliptic to broad-elliptic in lateral view and deeply 3-lobate with keels acute for *E. schultzei*) and seeds tetragonous in cross section (versus tetraquetrous in cross section for *E. schultzei*).

We have seen very few ample collections of this species and consequently the morphological variation within this species is poorly understood. The specimen *Milewski 207* is tentatively placed here. However, it has somewhat larger capsules and more prominent transversely ridged seeds than what are considered typical for this species.

Etymology: The specific epithet is from Latin *vicinus*, near, neighbouring, in reference to the species’ morphological similarity to *E. mitchelliana*.

57. *Euphorbia victoriensis* Halford & W.K.Harris, **species nova** arcte similis morphologicis *E. wheeleri* Baill. in simili sede crescens sed in tractu geographice disjuncto. Habitu plerumque minori seminum superficiebus porcis 4–6 prominentibus angustis rotundatis (ad vicem superficiebus foveatis vel reticulo-foveatis), capsulis minoribus 1.8–1.9 mm longis (ad vicem capsulis 2–2.8 mm longis) differt. Ante hac eandem cum *E. drummondii* Boiss. putata est sed seminum superficiebus porcis 4–6 prominentibus angustis rotundatis (ad vicem porcis 3–6 transversis distinctis), stipulis brevioribus 0.3–0.4 mm longis (ad vicem stipulis 0.5–0.9 mm longis), glandis involucribus patelliformibus superficiebus planis concavisve (ad vicem glandulis cupuliformibus lacuna centrali distincta et ore incrassata praeditis) stylis 0.4–0.6 mm longis 1/3–1/2 longitudinis bifidis apicibus teretibus ornatis (ad vicem stylis 0.2–0.3 mm longis integris vel vix bifidis apicibus clavatis ornatis) differt. **Typus:** Western Australia. c. 43 km W of Serpentine Lakes, 18 July 1972, *N.N.Donner 3943* (holo: AD).

Monoecious, annual or herbaceous perennial with slender woody taproot, few to many stems arising from rootstock, the whole plant glabrous. **Stems** prostrate or rarely erect, sparingly to much branched, smooth. **Interpetiolar stipules** narrow-triangular, 0.3–0.4 mm long, deeply bipartite; margin lacinate. **Leaves:** petiole 0.6–1 mm long, smooth; blade oblong or oblong-obovate, 3.6–7.2(11.5) mm long, 2.5–3.1(6.4) mm wide, 1.4–2.4 times longer than wide; adaxial and abaxial surfaces green sometimes with reddish tinge; smooth; base asymmetric with one side cordate or obtuse, the other cuneate; margin serrulate, sometimes only distally (rarely entire); apex rounded. **Cyathia** solitary at the distal nodes; peduncles c. 0.5 mm long, smooth. **Involucres** turbinate, 0.7–0.9 mm long, 0.9–1.1 mm across; lobes 5, triangular, 0.3–0.4 mm long, margin fimbriate; glands

4, stipitate, patelliform, planar to shallowly concave, transverse-oblong or reniform in outline, 0.2–0.3 mm long, 0.4–0.7 mm wide, yellowish green sometimes with reddish tinge; gland appendages inconspicuous or absent, spreading radially, transverse-linear, to 0.1 mm long, 0.6–0.7 mm wide, white often with reddish tinge, glabrous, margin erose; bracteoles 0.8–1 mm long, adnate for c. 1/4 of their length to involucre, free portion divided into \pm linear hairy segments. **Staminate flowers** 8–15 per cyathium; pedicels 0.8–1 mm long; staminal filaments c. 0.1 mm long. **Pistillate flowers:** styles 0.4–0.6 mm long, spreading, recurved distally, smooth, glabrous, each bifid for 1/3–1/2 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 2 mm long, broad-elliptic in lateral view, 1.8–1.9 mm long, 1.9–2.1 mm across, shallowly 3-lobate with keels obtuse, smooth; hypogynous disc entire. **Seeds** ovate in outline, 1.5–1.7 mm long, 0.9–1 mm tangentially, 0.9–1 mm radially, tetraquetrous in cross section; dorsal faces convex; ventral faces planar; all faces with 4–6 prominent, narrow, rounded, irregular ridges; exotesta thin, of even thickness over surface, grey-white, microreticulate, becoming mucilaginous when moistened; endotesta red-brown or dark brown. **Figs 24, 28K.**

Additional selected specimens examined: **Western Australia.** 11 miles [c. 18 km] E of Notabilis Hill, Gunbarrel Highway, Gibson Desert, Jul 1963, *George 5364* (PERTH); 33 miles [c. 53 km] SE of Windulda (Warburton Road), Aug 1962, *George 4009* (PERTH). **Northern Territory.** near Mt Connor, Jul 1958, *Cleland s.n.* (AD 966060055). **South Australia.** near WA border and Serpentine Lakes on road W of Emu, Jul 1979, *Williams 10671* (AD); 155 km W of Vokes Hill Junction, Aug 1980, *Alcock 8272* (AD); Anne Beadell Highway, unnamed Conservation Park, Great Victoria Desert, Aug 2001, *Friebe S112* (AD); 35 km W of Vokes Hill road junction, Jul 1979, *Williams 10535* (AD); c. 52 km W of Vokes Hill, corner on Connie Sue Highway, Aug 1980, *Mowling s.n.* (AD 98597043); 132 km N of Cook, Aug 1980, *Alcock 7980* (AD); 52 km N [of] Muckera Rockhole, Oct 1987, *Canty 2383* (AD); 98 km N of Cook on the road to Vokes Corner, Aug 1980, *Donner 7513* (AD).

Distribution and habitat: *Euphorbia victoriensis* occurs in the Great Victoria Desert in WA and SA. It has also been recorded from the southern corner of the Gibson Desert, WA

and the south western corner of the NT (**Map 57**). It has been recorded growing in open woodland communities on sand dunes.

Phenology: Flowers and fruits have been collected from July to October.

Notes: *Euphorbia victoriensis* is morphologically most similar to *E. wheeleri* and grows in a similar habitat although occurring in separate geographical areas. *Euphorbia victoriensis* differs in having a generally smaller habit, seeds surfaces with 4–6 prominent, narrow, rounded, irregular ridges (versus seed surfaces foveate or reticulate-foveate for *E. wheeleri*) and smaller capsules (1.8–1.9 mm long versus 2–2.8 mm long for *E. wheeleri*).

Euphorbia victoriensis has been previously identified as *E. drummondii*. It differs from that species in having seed surfaces with 4–6 prominent, narrow, rounded, irregular ridges (versus 3–6 distinct transverse ridges for *E. drummondii*), shorter stipules (0.3–0.4 mm long versus 0.5–0.9 for *E. drummondii*), involucre glands patelliform with a planar or concave surface (versus glands cupuliform, with distinct central pit and thickened rim for *E. drummondii*) and styles 0.4–0.6 mm long and bifid for 1/3–1/2 of their length, with terete apices (versus styles 0.2–0.3 mm long, entire or scarcely bifid, with clavate apices for *E. drummondii*).

Etymology: The species epithet refers to the Great Victoria Desert, in WA and SA, where this species occurs.

58. *Euphorbia wheeleri* Baill., *Adansonia* 6: 286–287 (1866); *Chamaesyce wheeleri* (Baill.) D.C.Hassall, *Aust. J. Bot.* 24: 640 (1976). **Type:** [Queensland. GREGORY SOUTH DISTRICT:] between Stokes Range and Coopers Creek, *s.d.*, *Dr Wheeler s.n.* (holo: P 313105; iso: MEL 1520270).

Illustration: Weber (1986: 755, fig. 403C).

Monoecious (rarely dioecious), herbaceous perennial to 50 cm high, with many stems arising from crown of thickened woody taproot, the whole plant glabrous. **Stems** ascending to erect or occasionally prostrate to decumbent, smooth. **Interpetiolar stipules**



Fig. 24. *Euphorbia victoriensis*. A. habit $\times 0.6$. B. branchlet with cyathia $\times 8$. C. leaf $\times 8$. D. stipules $\times 16$. E. cyathia with female flower $\times 32$. F. cyathia with fruit $\times 16$. G. cyathial gland with appendage, adaxial view $\times 32$. H. capsule, top view $\times 16$. I. capsule, lateral view $\times 16$. A from *Canty 2383* (AD); B–I from *Donner 3943* (AD). Del. W. Smith.

triangular or subulate, 0.6–1.6 mm long, deeply bipartite; margin lacinate. **Leaves:** petiole 0.3–1.4 mm long, smooth; blade oblong-elliptic, elliptic, oblong or sometimes obovate, 4–18 mm long, 2–8 mm wide, 1.7–2.4 times longer than wide; adaxial surface bright or dark green, smooth; abaxial surface pale green, smooth; base asymmetric with one side cordate, the other side cuneate; margin serrulate sometimes only distally or entire; apex rounded or retuse. **Cyathia** solitary at the nodes; peduncles 0.5–2 mm long, smooth. **Involucres** turbinate or cupuliform, 1–1.4 mm long, 0.9–1.9 mm across; lobes 5, triangular, 0.4–0.5 mm long, margin fimbriate; glands 4, stipitate, patelliform, planar or shallowly concave, transverse-oblong to \pm reniform in outline, 0.2–0.4 mm long, 0.4–0.8 mm wide, yellow, pink or red; gland appendages conspicuous to inconspicuous, spreading radially, lunate, 0.1–0.4 mm long, 0.8–1 mm wide, pink or white, glabrous, margin entire or shallowly irregularly lobed; bracteoles 0.8–1 mm long, adnate for *c.* 1/3 of their length to involucre, free portion divided into \pm linear hairy segments. **Staminate flowers** 20–25 per cyathium; pedicels 1–1.2 mm long; staminal filaments 0.3–0.4 mm long. **Pistillate flowers:** styles 0.4–0.8 mm long, ascending to erect, spreading distally, smooth, each bifid for 1/2–2/3 of their length, the apices terete. **Capsules** exserted from involucre on pedicel to 3 mm long, elliptic to broad-elliptic in lateral view, 2–2.8 mm long, 1.9–2.4 mm across, shallowly 3-lobate with keels obtuse, smooth; hypogynous disc entire. **Seeds** ovate in outline, 1.5–2.2 mm long, 0.8–1.2 mm tangentially, 0.7–1.1 mm radially, tetragonous in cross section; dorsal faces convex; ventral faces \pm planar; all faces foveate or reticulate-foveate; exotesta thin, of even thickness over surface, white, microreticulate, becoming mucilaginous when moistened; endotesta pale brown. *n* = 11. **Figs 28L, M.**

Additional selected specimens examined: **Western Australia.** *c.* 10 km SW of rockhole, Wilson Cliffs, Great Sandy Desert, May 1977, *deGraaf* 36 (PERTH); 60 miles [*c.* 96 km] NW of Giles, Aug 1962, *Kuchel* 280 (AD). **Northern Territory.** Lake Surprise area, Mar 1973, *Henry* 621 (DNA); False Mt Russell, 78 miles [*c.* 125 km] WSW [*of*] The Granites, Aug 1970, *Latz* 716 (AD, MEL); Finke River Railway Xing [crossing], Nov 1993, *Albrecht* 5531 (DNA, NT); Maryvale Station,

junction of Blackhill Bore and Maryvale Road, Aug 1988, *Barritt* 746 (DNA); 1.5 km SSW [*of*] Indracowra homestead, Aug 2000, *Albrecht* 9376 (NT); Amerada Petroleum Corp. No. 1 Hale River, Nov 1966, *Symon* 4376 (AD). **Queensland.** GREGORY NORTH DISTRICT: Monkira Station towards Cluny Station, Sep 1969, *Gittins* 1952 (BRI, NSW); 164 km from Windorah on Bedourie Road, Apr 1997, *Forster* PIF20607 & *Holland* (BRI, MEL). GREGORY SOUTH DISTRICT: 10 miles [*c.* 16 km] E of Birdsville, May 1975, *Hassall* 7523 (BRI); 40 miles [*c.* 64 km] W of Windorah, May 1975, *Hassall* 7527 (BRI); Mt Howitt Station, 128 km W of Eromanga, Jul 1936, *Blake* 11921 (AD, BRI); 83 km by road NW of Quilpie on the road to Windorah, Mar 2001, *Thomas* 1936 & *Fechner* (BRI). **South Australia.** Simpson Desert, Aug 1991, *Jessop* 124 (AD, BRI); Birdsville Track, Goyder Lagoon, Aug 1975, *Jackson* 2733 (AD); Oodnadatta, Dec 1977, *Knight* 212 (AD); Mungeranie homestead, Sep 1956, *Cleland* *s.n.* (AD 96806425); 5 km SSW of Olympic Dam Mine, May 1989, *Badman* 2588 (AD). **New South Wales.** 2.7 km ESE of Cameron Corner, Oct 1986, *Rodd* 5773 *et al.* (AD, NSW).

Distribution and habitat: *Euphorbia wheeleri* is widespread in central Australia from the Great Sandy and Gibson Deserts, in WA, through southern NT and northern-east SA to south-western Qld and far north-western NSW (**Map 58**). It grows primarily in open shrubland or *Zygochloa* grassland communities on deep red sands or sandy loams on desert dunes, also recorded on interdune flats, sandy river banks, and in *Triodia* grassland on deep red sand on open sandplains.

Phenology: Flowers and fruits have been collected throughout the year, particularly from May to October.

Notes: *Euphorbia wheeleri* is morphologically most similar to *E. myrtooides* and *E. victoriensis*. In addition to its geographic separation for those species, it is easily distinguished from both species by its foveate to reticulate-foveate seed surface.

As accepted here, *Euphorbia wheeleri* shows some variation in the seed shape and seed surface texture. The typical form occurs across the species range, and has seeds that are generally slender ($1.6\text{--}2.2 \times 0.8\text{--}1 \times 0.7\text{--}0.9$ mm) with a foveate surface (**Fig. 26M**). A second less common form is found only in the region from near Finke, NT, south to Arcoona, SA. The seeds are generally shorter and broader ($1.5\text{--}1.9 \times 1.1\text{--}1.2 \times 1\text{--}1.1$ mm) and have a reticulate-foveate surface (**Fig. 26N**). Representative specimens of this second

form are: Northern Territory. Bundooma, Jun 1935, *Cleland s.n.* (AD 97405252); Uluru N.P., 34 km WNW of Ranger Station, May 1988, *Lazarides 153 & Palmer* (AD, DNA); Erldunda Station, Jun 1935, *Cleland s.n.* (AD 97405248). South Australia. near Marla, Apr 1997, *Bates 47351* (AD); Pedirka, Aug 1932, *Ising s.n.* (AD 966031152); c. 8 km E of Macumba homestead, Sep 1931, *Ising s.n.* (AD 966030967); Moonlands Bore, Todmorden Station, Aug 1992, *Badman 5869* (AD 99326003); Macumba Station, Nov 1950, *Ising s.n.* (AD 966150249); off Borefield road, near Canegrass Swamp, Apr 1997, *Bates 46879* (AD); Arcoona, Sep 1927, *Murray 170* (AD). This variant may, with further collections and research, be found to represent a distinct taxon.

Excluded names

Euphorbia atoto G.Forst., *Fl. Ins. Austr.* 36 (1786); *Chamaesyce atoto* (G.Forst.) Croizat, in O. Degener, *Fl. Hawaiiensis Fam.* 190. (1936). **Type:** Society Islands, Tahiti, *s.d.*, *Herbier Forster 110* (lecto: P-Forst *n.v.* [image seen]; isolecto: BM 1014903 *n.v.* [image seen], G *n.v.*, GEOT *n.v.* [image seen], UPS-THUNB *n.v.* (IDC microfiche 1036-16. 479, II. 1), *fide* Florence [1996: 242–243].

As circumscribed by Florence (1996), *Euphorbia atoto* is endemic to Tahiti. The Australian specimens previously assigned to this species are referable to *E. litticola*, *E. obliqua* or *E. pallens*.

Euphorbia chamaesyce L., *Sp. Pl.* 1: 455 (1753). **Type:** “Habitat in Europa australi, Sibiria” unknown locality, *s.d.*, *Löfving 373* (lecto: LINN [*Herb. Linn. No. 630.15*] *n.v.* (image seen) (IDC microfiche 177. 320: I. 1), *fide* Khan [1964: 152]).

In Australia, this name has been misapplied to *Euphorbia drummondii*, *E. maculata*, *E. prostrata* and *E. thymifolia* (Hooker 1855–1859; Dunlop *et al.* 1995; Paczkowska & Chapman 2000).

Euphorbia drummondii var. *dallachyana* Baill., *Adansonia* 6: 285 (30 July 1866). **Type citation:** “Dallachy, “Pine Plains”, cum typo (Herb. F. Muell.!) – Murray, Cooper’s creek (herb. F. Muell.!).”

We have been unable to locate the type material of this variety. There is a collection in MEL (2179478) with the information “*Euphorbia drummondii*, Baill. Cooper’s Creek” hand written on a blue Phytologic Museum of Melbourne label. There is no indication that it was seen by Baillon or that it is *E. drummondii* var. *dallachyana* of Baillon. This collection is referable to *E. dallachyana*.

Euphorbia drummondii var. *erythropeplis* Baill., *Adansonia* 6: 285 (30 July 1866). **Type:** Western Australia. Murchison R., [without date,] *Oldf.* [*Oldfield*] 1082 (holo: MEL 2179193).

There is insufficient material to place this name with any certainty. The seeds and fruits of this taxon are unknown. The involucre glands and gland appendages are similar to *Euphorbia drummondii*; however, the leaves are smaller and thicker, and more or less entire.

Euphorbia bracteolaris Boiss., *Cent. Euphorb.* 8 (1860). *Euphorbia hypericifolia* var. *bracteolaris* (Boiss.) Ewart, *Proc. Roy. Soc. Victoria* 19: 41 (1907). **Type citation:** “In montibus Nilagiris Indiae (Perrottet sub n. 1832 ex parte).”

This name is not applicable to any Australian taxon. The Australian specimen (Elder Expl. Exp. 1892 lat 27 deg. 5 mS., long. 119 deg. 15 m. E [MEL 2179930]) assigned by Ewart (*loc. cit.*) to this variety is referable to *Euphorbia coghlanii*.

Euphorbia pilulifera L., *Sp. Pl.*: 454 (1753), *nom. rej.*, *fide* Esser & Cafferty (2001); (2006). McNeill *et al.* (2006). **Type:** “Habitat in India.” (lecto: LINN [*Herb. Linn. No. 630.8*] (image seen), *fide* Brown *et al.* (1911: 497–498)).

In Australia, the name *Euphorbia pilulifera* has been misapplied to the species *E. hirta* (Bentham 1873; Domin 1927). The correct name for the type of the name *E. pilulifera* is *E. parviflora* L. This name is not applicable to any Australian species.

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Fig. 25.

◀ **Fig. 25.** Dorsal and lateral views of *Euphorbia* seeds: A. *E. albrechtii* [Chippendale 2019 (DNA)]. B. *E. armstrongiana* var. *distans* [Fryxell & Craven 3889 (PERTH)]. C. *E. australis* var. *subtomentosa* [Trudgen 2616 (PERTH)]. D. *E. biconvexa* [Halford Q9061 & Batianoff (BRI)]. E. *E. bifida* [Williams 7679 (BRI)]. F. *E. careyi* [Mitchell PRP1492 (BRI)]. G. *E. carissoides* [Forster PIF30791 (BRI)]. H. *E. centralis* [Latz 908 (DNA)]. I. *E. cinerea* [Cranfield 6728 (PERTH)]. J. *E. clementii* [Thomson 3498 (BRI)]. K. *E. coghlanii* [Halford Q9015 & Batianoff (BRI)]. L. *E. crassimarginata* [McDonald KRM4047 (BRI)]. M. *E. dallachyana* [Forster PIF16701 & Figg (BRI)]. N. *E. drummondii* [Aplin 2205 (PERTH)]. O. *E. ferdinandi* var. *ferdinandi* [Kalotas 354 (DNA)]. P. *E. ferdinandi* var. *appendiculata* [Halford Q8604 & Thomas (BRI)]. Q. *E. ferdinandi* var. *saxosiplaniticola* [Badman 8796 (AD)]. R. *E. fitzroyensis* [Thomson 3475 (NT)]. Scale bars = 1 mm.

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Fig. 26.

◀ **Fig. 26.** Dorsal and lateral views of *Euphorbia* seeds: A. *E. flindersica* [Kuchnel 3169 (AD)]. B. *E. gregoriensis* [Thomson 1166 (DNA)]. C. *E. hassallii* [Barritt 1700 (BR1)]. D. *E. hirta* [Halford Q7478 (BR1)]. E. *E. hyssopifolia* [Batianoff 981087 (BR1)]. F. *E. inappendiculata* var. *inappendiculata* [Thomson 3503 (DNA)]. G. *E. inappendiculata* var. *queenslandica* [Latz 3576 (DNA)]. H. *E. inappendiculata* var. *robustior* [Kemp 890 & Fairfax (BR1)]. I. *E. kimberleyensis* [Kennedy 6704 (PERTH)]. J. *E. laciniloba* [Halford Q8783 & Batianoff (BR1)]. K. *E. litticola* [Munir 6125 (BR1)]. L. *E. macdonaldii* var. *macdonaldii* [McDonald KRM3913 & Little (BR1)]. M. *E. macdonaldii* var. *potentillina* [McDonald KRM3512 (BR1)]. N. *E. maconochieana* [Perry & Lazarides 2025 (BR1)]. O. *E. maculata* [Halford Q7512 & Batianoff (BR1)]. P. *E. mitchelliana* var. *mitcheiliana* [Neldner 3843 (BR1)]. Q. *E. muelleri* [Leach 3258 (DNA)]. R. *E. multifaria* (typical form) [Donner 1684 (AD)]. Scale bars = 1 mm

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Fig. 27.

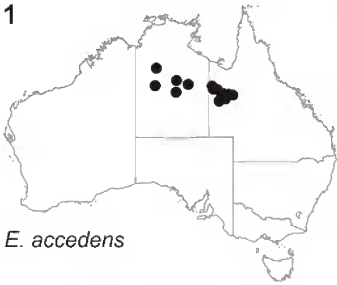
◀ **Fig. 27.** Dorsal and lateral views of *Euphorbia* seeds: A. *E. multifaria* (Nullarbor form) [Downing 987 (PERTH)]. B. *E. myrtoides* [Halford Q9294 (BRI)]. C. *E. obliqua* [Batianoff 205071 (BRI)]. D. *E. occulta* [Booth 3536 (BRI)]. E. *E. ophiolitica* [Forster PIF3393 (BRI)]. F. *E. ophthalmica* [Batianoff 210201 (BRI)]. G. *E. pallens* [Bean 3874 (BRI)]. H. *E. papillata* var. *papillata* [Halford Q8597 & Thomas (BRI)]. I. *E. papillata* var. *laevicaulis* [Thompson & Wilson TAN551 (BRI)]. J. *E. papillifolia* [McDonald KRM6036 (BRI)]. K. *E. petala* [Halford Q607 (BRI)]. L. *E. philochalix* [Thomson 3515 (DNA)]. M. *E. porcata* [Hassall 7521 (BRI)]. N. *E. prostrata* [Waterhouse BMW1444 (BRI)]. O. *E. psammogeton* [Bean 12243 (BRI)]. P. *E. psilosperma* [Thomson 2237 (DNA)]. Q. *E. schizolepis* [Egan & Cowie 3238 (BRI)]. R. *E. schultzei* var. *schultzei* [Simon 3986 & Cranfield (BRI)]. Scale bars = 1 mm.

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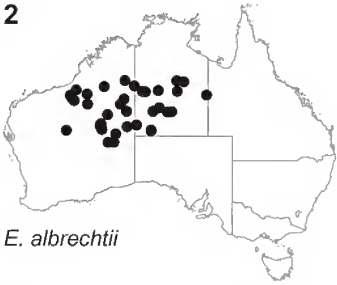


Fig. 28. Dorsal and lateral views of *Euphorbia* seeds: A. *E. schultzei* var. *comans* [Henshall 3481 (BRI)]. B. *E. serpens* [Halford Q8135 & Harris (BRI)]. C. *E. thelephora* var. *thelephora* [Neldner & Stanley 1870 (BRI)]. D. *E. thelephora* var. *australis* [Jackson 5147 (AD)]. E. *E. thelephora* var. *rugosa* [Nelson 2860 (DNA)]. F. *E. thymifolia* [Clarkson 4597 (BRI)]. G. *E. trigonosperma* [McDonald KRM4841 (BRI)]. H. *E. vaccaria* var. *vaccaria* [Halford Q9181A (BRI)]. I. *E. verrucitesta* [Spooner 16298 (AD)]. J. *E. vicina* [Willing 249 (PERTH)]. K. *E. victoriensis* [Cleland s.n. (AD 966060055)]. L. *E. wheeleri* (typical form) [Hassall 7527 (BRI)]. M. *E. wheeleri* [Bates 46879 (AD)]. Scale bars = 1 mm.

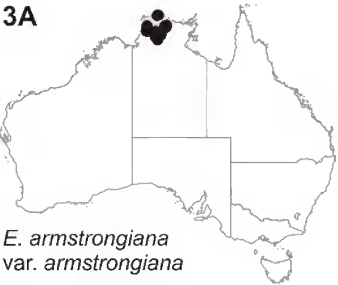
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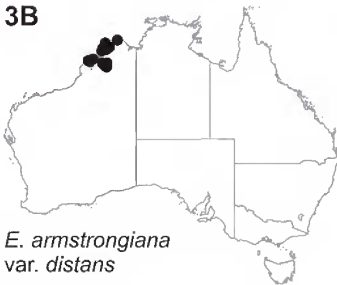
2



3A



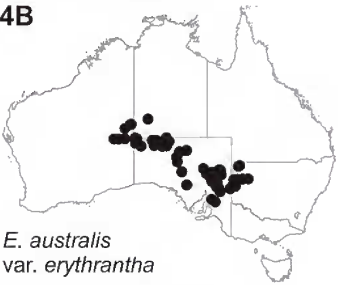
3B



4A



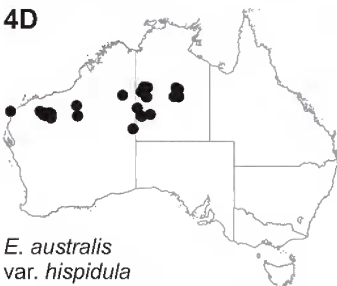
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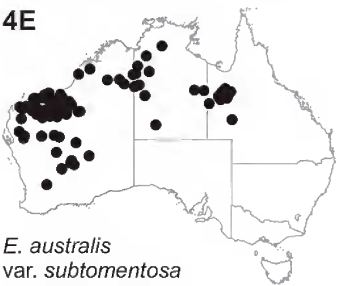
4C



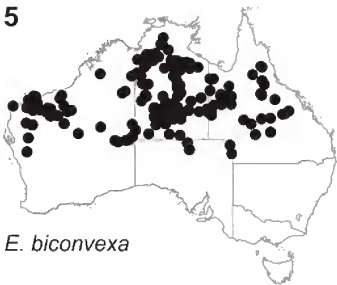
4D



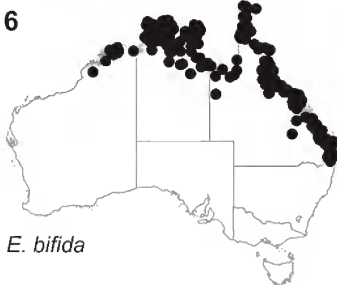
4E



5



6



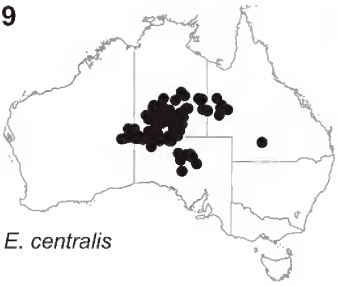
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8



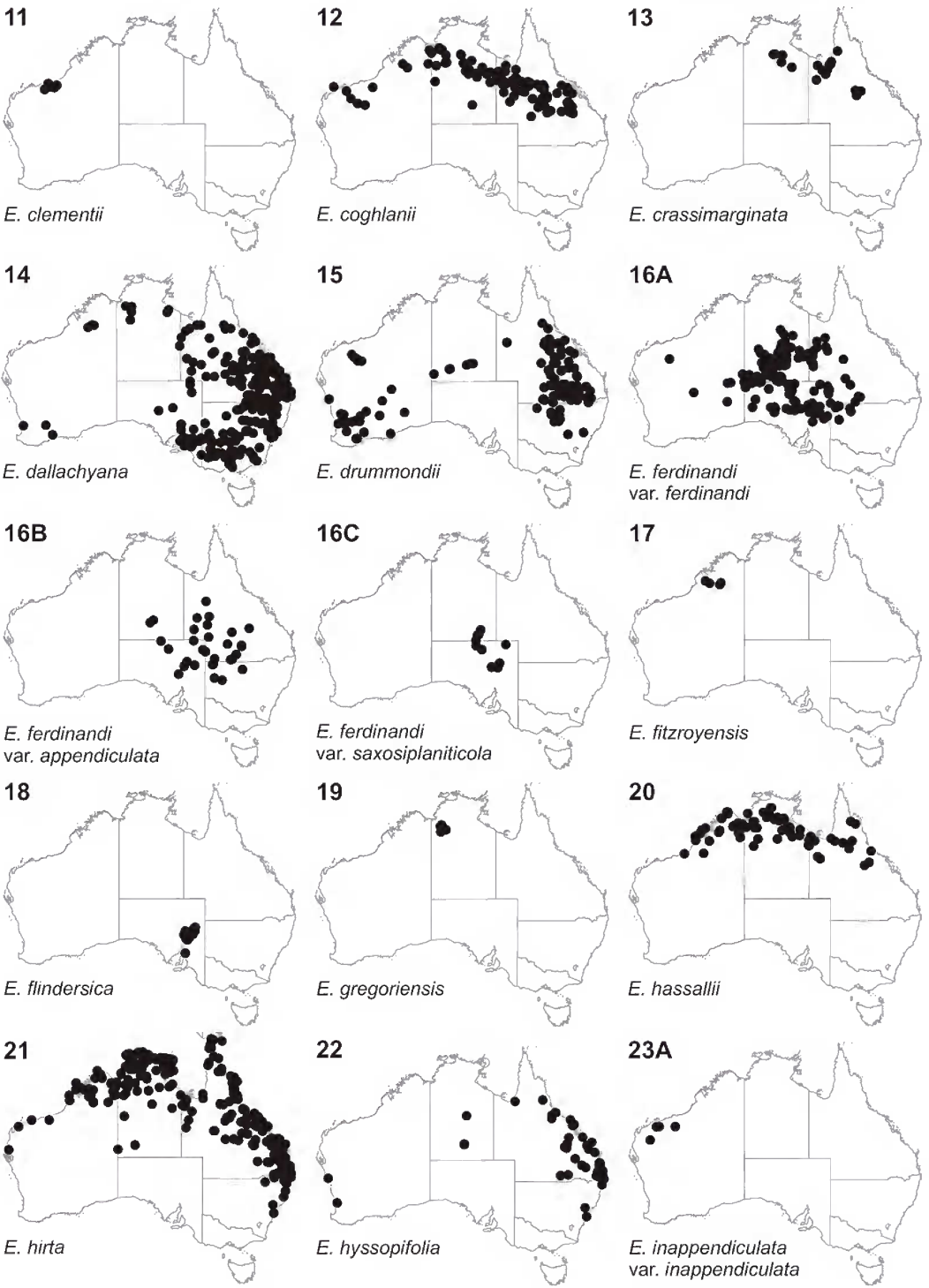
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10

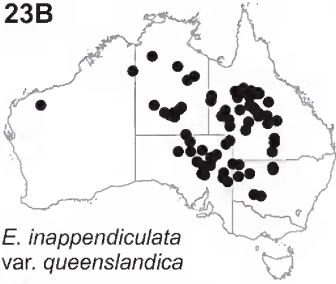


Maps 1-10.



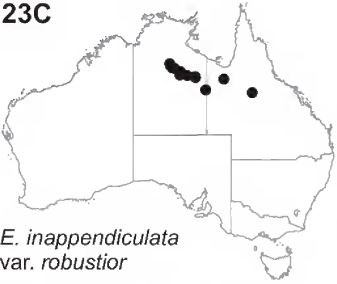
Maps 11-23A.

23B



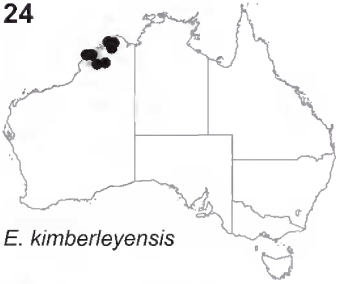
E. inappendiculata
var. *queenslandica*

23C



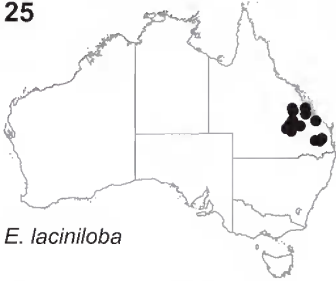
E. inappendiculata
var. *robustior*

24



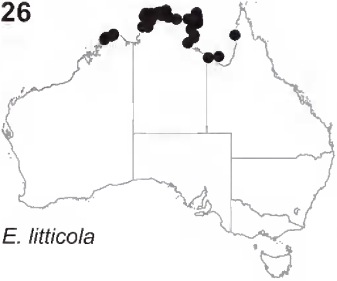
E. kimberleyensis

25



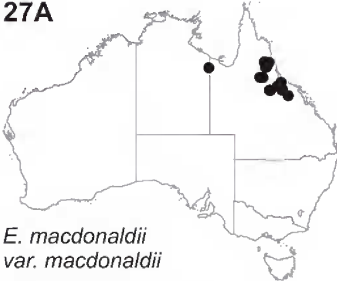
E. laciniloba

26



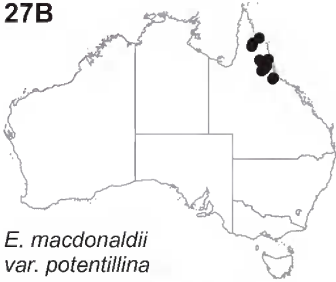
E. litticola

27A



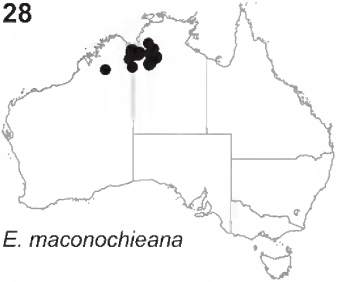
E. macdonaldii
var. *macdonaldii*

27B



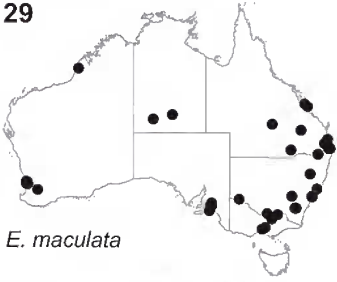
E. macdonaldii
var. *potentillina*

28



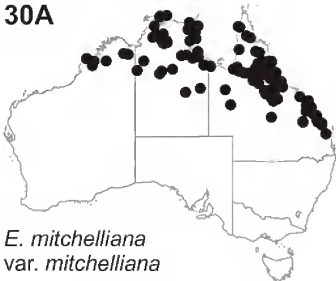
E. maconochieana

29



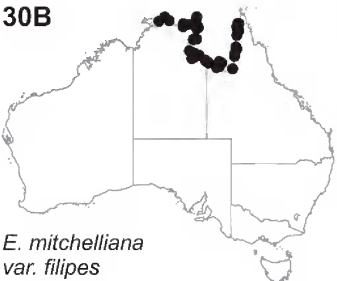
E. maculata

30A



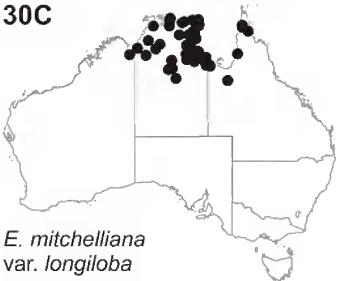
E. mitchelliana
var. *mitchelliana*

30B



E. mitchelliana
var. *filipes*

30C



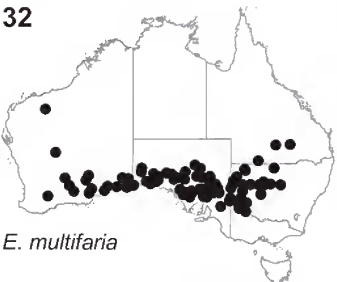
E. mitchelliana
var. *longiloba*

31



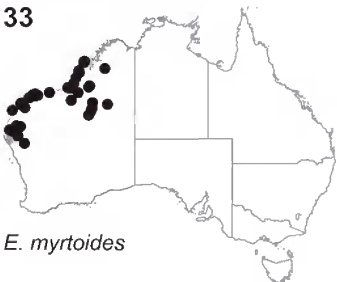
E. muelleri

32



E. multifaria

33



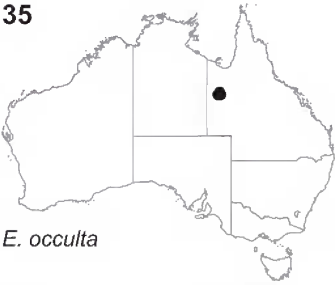
E. myrtoides

Maps 23B-33.

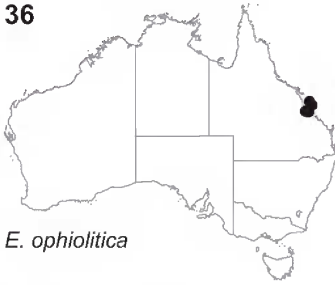
34



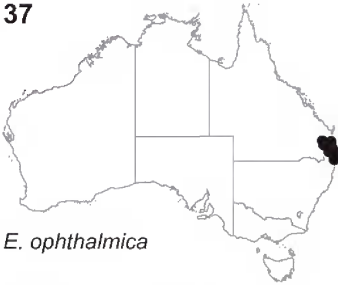
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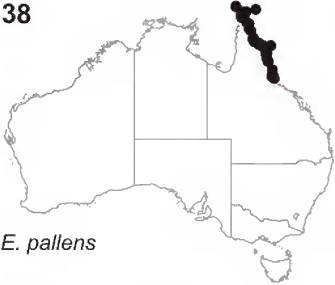
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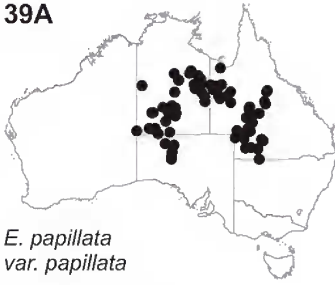
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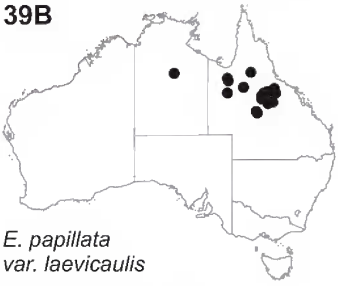
38



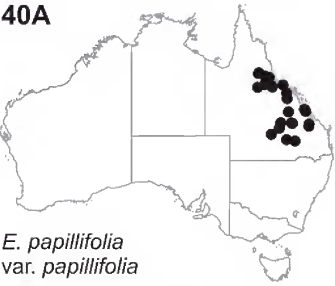
39A



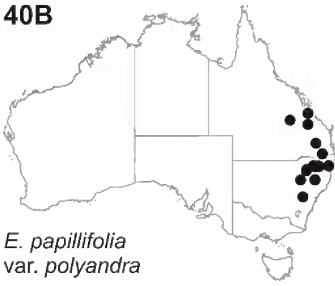
39B



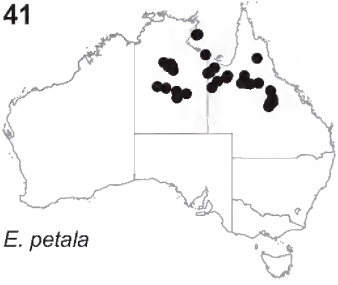
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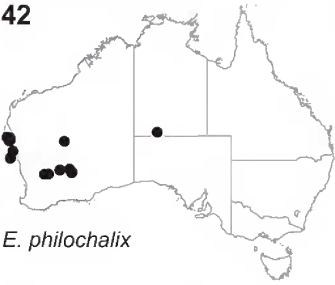
40B



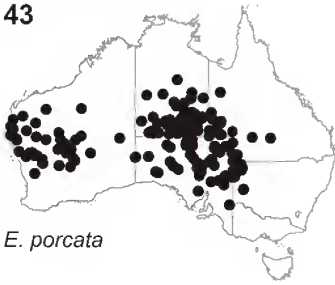
41



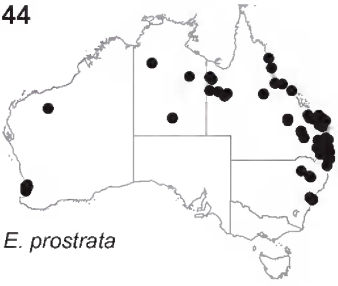
42



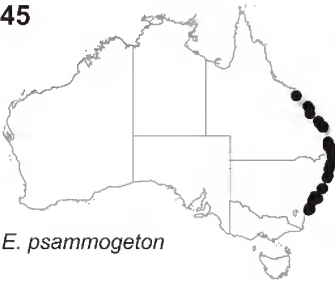
43



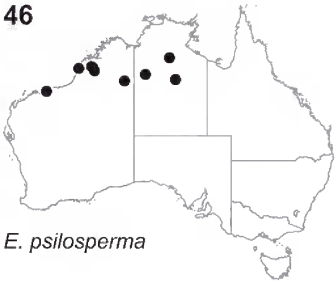
44



45

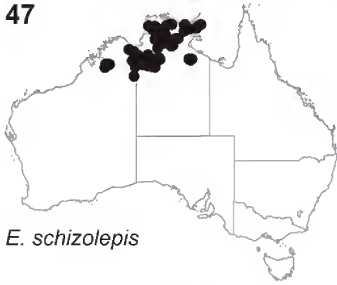


46



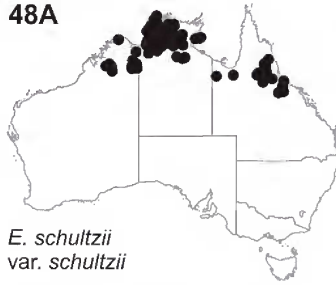
Maps 34–46.

47



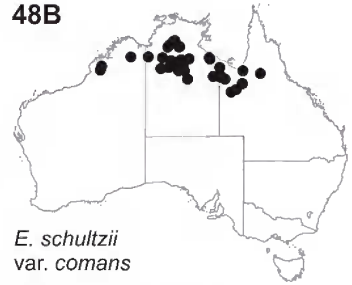
E. schizolepis

48A



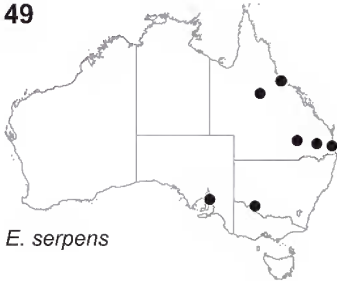
E. schultzii
var. *schultzii*

48B



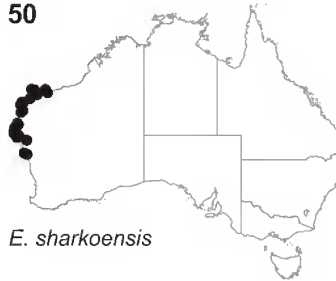
E. schultzii
var. *comans*

49



E. serpens

50



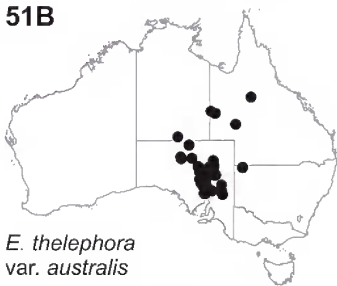
E. sharkoensis

51A



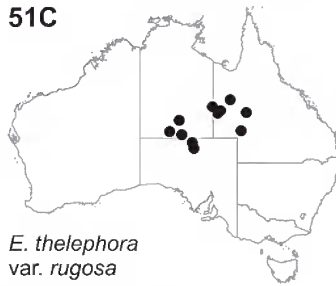
E. thelephora
var. *thelephora*

51B



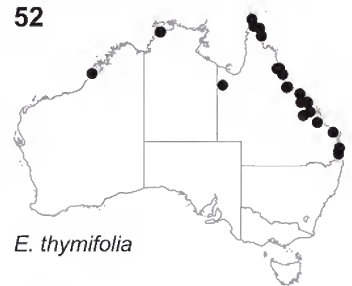
E. thelephora
var. *australis*

51C



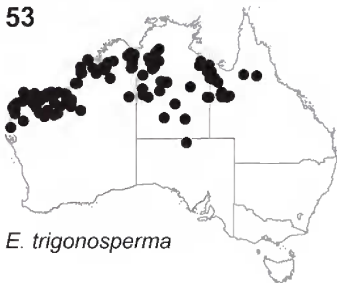
E. thelephora
var. *rugosa*

52



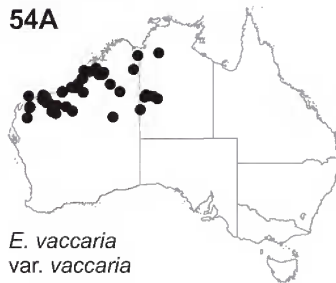
E. thymifolia

53



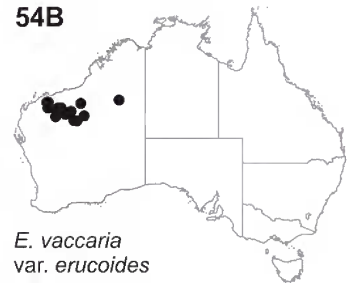
E. trigonosperma

54A



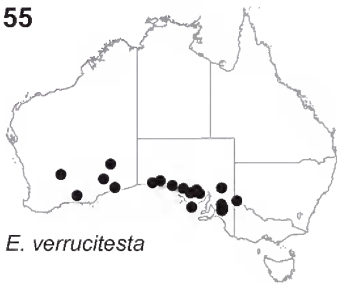
E. vaccaria
var. *vaccaria*

54B



E. vaccaria
var. *erucoides*

55



E. verrucitesta

56



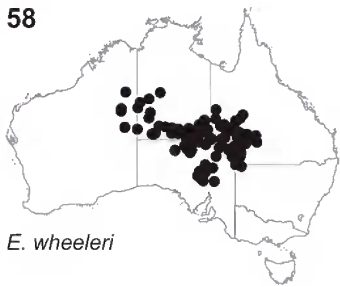
E. vicina

57



E. victoriensis

Maps 47-57.



Map 58.

Appendix 1. List of chromosome numbers for Australian taxa of *Euphorbia* sect. *Anisophyllum* (data from Hassall 1977 and BRI database).

Taxon	<i>n</i> =	Queensland Herbarium AQ number of voucher specimens
<i>E. australis</i> var. <i>erythrantha</i>	11	475107
<i>E. australis</i> var. <i>subtomentosa</i>	11	475110, 475112, 475113, 478151
<i>E. biconvexa</i>	8	475032, 475033, 475037, 475041, 475042, 475043, 475044, 475045, 475046
<i>E. bifida</i> (coastal form)	8	475047, 475048, 475050, 475088
<i>E. bifida</i> (narrow leaf form)	8	475072, 475074, 475075
<i>E. coghlanii</i>	8	475034, 475035, 475036, 475038, 475057
<i>E. crassimarginata</i>	11	475165, 475167, 475168
<i>E. dallachyana</i>	11	475134, 475135, 475136, 475137, 475138, 475139, 475140, 475141, 475142, 475143, 475144, 475145, 475146, 475147, 475148, 475150, 475151, 475152, 475153, 475154, 475155, 475156, 475157, 475170
<i>E. dallachyana</i>	22	447303, 447304, 447305, 447306, 447311, 447317, 447318, 447319, 447320, 447321, 447322, 447323, 447327, 447278, 447279, 475115, 475116, 475117, 475118, 475121
<i>E. drummondii</i>	11	447280, 447300, 447301, 447307, 447308, 447309, 447310, 447312, 447325, 447326, 447328, 447330, 447331, 447332, 447333, 447334, 447335, 447337, 447339, 447345, 447346, 447347, 447348, 475085, 475087, 475163, 475164
<i>E. ferdinandi</i> var. <i>ferdinandi</i>	11	475097, 475098, 475099, 475100, 475101, 475103
<i>E. ferdinandi</i> var. <i>appendiculata</i>	11	447284, 447289, 447290, 447292

Taxon	n=	Queensland Herbarium AQ number of voucher specimens
<i>E. flindersica</i>	11	475128
<i>E. hassallii</i>	11	475125, 475127
<i>E. inappendiculata</i> var. <i>queenslandica</i>	11	447283, 447298, 447343, 475122, 475123, 475161
<i>E. macdonaldii</i> var. <i>potentillina</i>	11	475106
<i>E. mitchelliana</i> var. <i>longiloba</i>	8	475055, 475058
<i>E. mitchelliana</i> var. <i>mitchelliana</i>	8	475054, 475059, 475060, 475062, 475061, 475063, 475064, 475065, 475066
<i>E. multifaria</i>	11	447287, 447288, 447295, 447296, 447313, 447314, 447315, 447336
<i>E. papillata</i> var. <i>papillata</i>	11	475093, 475096, 475104
<i>E. papillifolia</i> var. <i>polyandra</i>	11	475129
<i>E. philochalix</i>	11	475130, 475131, 475132
<i>E. porcata</i>	11	447299, 447294, 475120, 447324, 447285, 447316, 447286, 447282, 447297
<i>E. psammogeton</i>	8	475049
<i>E. schultzei</i>	11	475105
<i>E. thelephora</i> var. <i>rugosa</i>	11	475111
<i>E. thelephora</i> var. <i>thelephora</i>	11	475069, 475070, 475071, 475095
<i>E. wheeleri</i>	11	475080, 475082, 475083, 475084, 475077, 475078, 475079, 475240

Index to Scientific Names

Names in **bold** type are accepted names and those in light type are synonyms, *etc.* The numbers refer to the taxa enumerated above and excl. refers to 'Excluded names' section.

<i>Chamaesyce alsiniflora</i> (Baill.) D.C.Hassall	30b
<i>Chamaesyce atoto</i> (G.Forst.) Croizat.	excl.
<i>Chamaesyce australis</i> (Boiss.) D.C.Hassall	4
<i>Chamaesyce biconvexa</i> (Domin) D.C.Hassall	5
<i>Chamaesyce bifida</i> (Hook. & Arn.) T.Kuros.	6
<i>Chamaesyce carissoides</i> (F.M.Bailey) P.I.Forst. & R.J.F.Hend.	8
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